ELEKTRA BECKUM®

INDUSTRIAL

Operating Instructions
MIG Welding Machines

OMEGA 400 SEK/W (TIG AC/DC + MIG/MAG)
OMEGA 400 SEK/WX (TIG AC/DC)

Important!
Read these instructions carefully before installation and initial operation of this welding power source

03/94 - EB-D
Stock-no. 115 117 8541

Contents

1.0 Machine Conception

The multi discipline integrated welding unit OMEGA 400 SEK/W is a secondary-switched inverter serving as a welding power source for MIG/MAG welding,TIG welding AC/DC and Manual Arc welding.
All three major welding processes, used for different applications, are carried out with a single welding machine. All applications, from welding aluminium and stainless steel extrusions to heavy machinery construction and ship building, are carried out with optimal results and top weld quality (spatter-free welding, no weld finishing).
This is achieved by a newly designed secondary inverter and a new, patented display control unit. Three rotary switches and a LCD display provide the operator with complete control for all welding processes. In addition the operator can store different welding parameters and recall these when required (MIG/MAG and TIG only).
Both the OMEGA 400 SEK/W and SEK/WX have an electronically controlled choke, providing for spatter-free welding. Also the operator can choose between a hard or soft arc.
The complete unit is constantly monitored by a fault detection unit. In the event of an internal or external fault the cause is shown in the display in plaintext.
All electronic components are protected against dust built-up. The LCD-display is protected by an impact-resistant plexiglass panel.
All electronic components are electrically separated and short-circuit proof, the control circuits are thus potential free and safe from harm by defective power cables etc. Both machines conform to the EN 60974/1 standard.
Model OMEGA 400 SEK/WX is a TIG welding machine only; it can be adapted later to the MIG/MAG function by connecting the external Wire Feed Unit SDV 250 RC (see 4.2 below).

1.1 Scope of Application

- suitable for operation in areas with increased electrical hazard (S)
- MIG/MAG welding (stepless control)
- TIG DC welding in 2- and 4-cycle mode
- TIG AC welding in 2- and 4-cycle mode
- TIG AC/DC pulse welding
- manual arc welding (stick welding)
- separate wire feeder can be connected
- computer interface to connect to welding robots
- suitable for welding of low-carbon steels, steel alloys, NF-metals and aluminium.

1.2 Important Information

MIG/MAG torch and/or TIG torch/electrode holder can both be connected to the machine at the same time, **but both are under current when the welding current is activated. The torch not in use has to be placed on an insulated pad or backing.**
This allows for a quick change-over to a different welding process by simply setting the to a different welding mode.

The MIG/MAG torch`s trigger switch and the red button of the TIG torch work parallel, i.e. with the machine in TIG mode it welding can be started by engaging the MIG/MAG torch trigger switch, and vice versa!!

Do not use a foot control unit and a TIG torch with remote control potentiometer at the same time, as these will interfere with each other.

Important: Do not operate near data processing equipment. Ensure potential separation for computer interface.

1.1 User Responsibility

This machine will perform in conformity with the description contained in the instructions provided. This machine must be checked periodically. Defective equipment (including service leads) should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repair or replacement become necessary, it is recommended that such repairs are carried out by qualified persons approved by Elektra Beckum or their representatives. This machine or any of its parts should not be altered from standard specifications. The user of this machine shall have the sole responsibility for any malfunction which results from improper use or unauthorized modification from standard specifications, faulty maintenance, damage or improper repair by anyone other than qualified persons approved by Elektra Beckum or their representatives.

Do not disassemble the pressure regulator. It may explode if re-assembled incorrectly.
Danger of personal injury!!

1.2 System Component Combinations

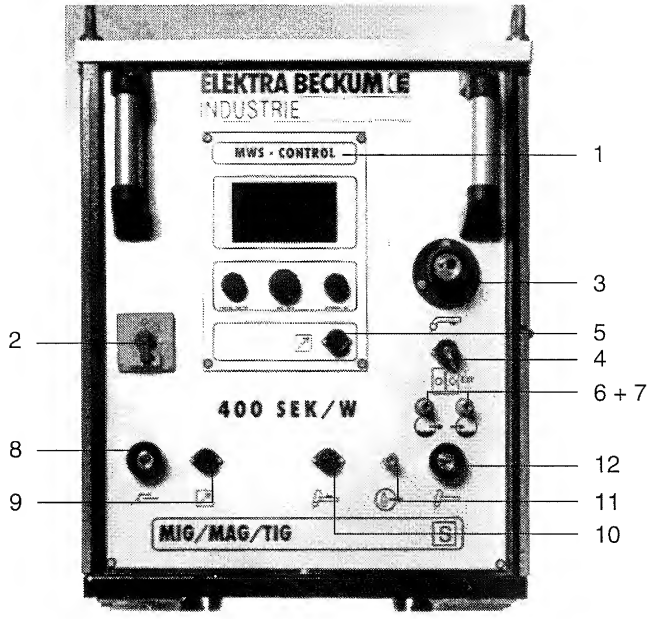
		MIG/MAG-TIG AC/DC 400 SEK/W	TIG AC/DC 400SEK/WX
Description	**Stock-no.**	**0021084107**	**0021084000**
MIG torch, 3 mtr leads	090 200 8330	X	-
MIG torch, 4 mtr leads	090 200 8349	X	-
MIG torch, 5 mtr leads	090 200 8357	X	-
Earth cable ass'y, 50mm², 5 mtr lead	090 201 1315	X	X
Separate Wire Feed Unit SDV 250 RC	090 201 0840	X	X
Separate Wire Feed Unit SDV 250 E	090 200 5544	X + adaptor	X + adaptor
Adaptor SDV 250 E - SEK/W	090 201 1285	X	X
Trolley for SDV 250 E/EC	090 201 0882	X	X
Torch lead extension, 70mm², 5 mtr leads, water-cooled, interconnecting	090 201 1269	X	X
Torch lead extension, 70mm², 10 mtr leads, water-cooled, interconnecting	090 201 1277	X	X
TIG torch AW 424, 4 mtr leads	090 201 2826	X	X
TIG torch AW 424, 8 mtr leads	090 201 2834	X	X
TIG torch SR 18, 4 mtr leads, water-cooled	090 201 2036	X	X
TIG torch SR 18, 8 mtr leads, water-cooled	090 201 2516	X	X
TIG torch SR 26, 4 mtr leads	090 200 9108	X	X
TIG torch SR 26, 8 mtr leads, remote control	090 200 8055	X	X
Foot control unit, 5 mtr leads	090 200 7210	X	X
Accessory kit no. 9, 50mm² (manual arc)	132 702 2675	X	X
Adaptor for wire basket K 300	090 201 2630	X	-
Pressure regulator, dual clock	090 200 5293	X	X
Welding visor, hand held	090 200 5528	X	X
Silicon grease nozzle dip, 80 g tin	132 703 8300	X	X
Anti-spatter spray, 150 ml aerosol	132 703 8296	X	X
Wire brush, 2-row	090 200 3908	X	X
Torch cleaning pliers	090 200 3916	X	X

1.3 Specifications

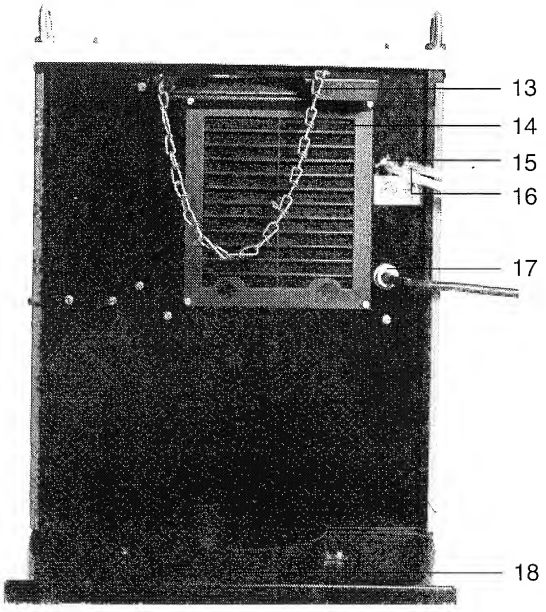
Both models meet the EN 60974-1 standard and are approved for boiler welding.

Supply voltage		3~ 400 V ± 10 %	Setting	stepless
Main frequency		50-60 Hz	MIG/MAG electrode wire Ø	0.6 - 1.6 mm
Open circuit voltage		56 V	Power factor φ	0.87
Operating voltage	TIG	10.2 - 26 V	MIG/MAG wire feed drive	4-roller heavy-duty
	manual arc	20.2 - 36 V	Protection class	IP 23
	MIG/MAG	15 - 34 V	Insulation class	F
Setting range	TIG	5 - 400 A	Cooling	fan
	manual arc	5 - 400 A		
	MIG/MAG	20 - 400 A		
Input capacity	TIG	13 kVA		
	manual arc	19 kVA		
	MIG/MAG	18 kVA		
Duty cycle at	TIG	100 %		
max. output	manual arc	60%		
	MIG/MAG	70%		
100% duty cycle at	TIG	400 A		
	manual arc	300 A		
	MIG/MAG	330 A		

2.0 Description
2.1 Panel Controls



Pic. 1 Front panel



Pic. 2 Rear view

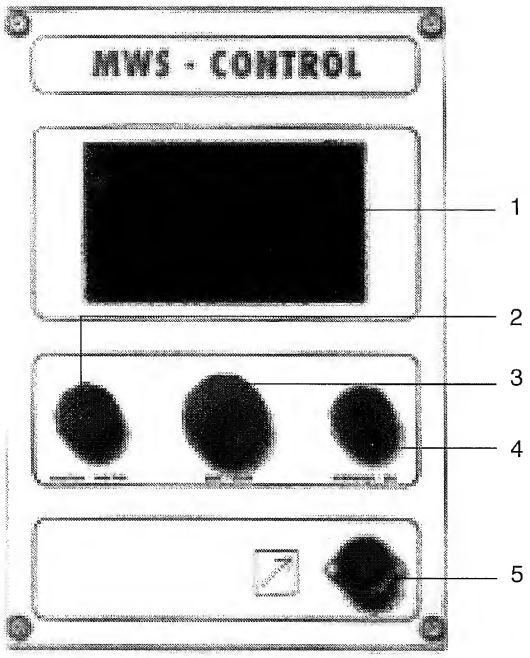
1 MWS Multi-Function Control
(description and operation see 3.0 below)
2 Mains ON/OFF switch
A starting current limiter positively prevents start-up current peaks, keeping standard circuit breaker or time-lag fuses from tripping.
3 Euro-connector
Connector for MIG/MAG torch leads and torch lead extensions. With integrated shielding gas supply.
4 Socket for external wire feed unit pilot leads
5 Computer interface/socket for remote control unit for external wire feed unit SDV 250 RC
6 + 7 Torch Coolant couplings
8 Earth cable/electrode holder cable socket
9 Socket for TIG foot control unit
(arc starting with foot control unit possible)
10 Socket for TIG torch pilot leads
11 TIG shielding gas line coupling
12 TIG torch current lead/electrode holder socket
13 Gas cylinder rack with safety chain
14 Cooling fan screen
15 Coupling MIG/MAG shielding gas supply
16 Coupling TIG shielding gas supply
17 Power supply cable
18 Gas cylinder bracket

3.0 Multi Welding System (MWS) Control Description/Instructions
3.1 General

To make setting as simple as possible, the number of control elements is reduced to 3 rotary controls with the following functions:

1.	Left control knob	**ITEM**	Selects a menu or parameter (turn clockwise for next parameter, turn counter-clockwise for previous parameter or menu)	
2.	Center control knob	**VALUE**	Selects parameters/changes values	
3.	Right control knob	**ARC**	MIG/MAG	Changes the arc voltage (penetration)
			TIG	Changes the balance (penetration - arc cleaning action)

Approx. 10 sec after the machine is switched on, the MWS control will display the main menu of the welding process that was active before the machine was switched off (exception: water cooling set OFF, refer to 3.2.2 below).
This is also the case after changing functions or parameters. If no controls are activated, the MWS control will return automatically to the main menu.
If the torch trigger switch is engaged the display returns immediately to the main menu, regardless of the currently selected submenue, and the welding process starts.



Pic. 3 MWS control

1 LCD display
2 Control knob ITEM, selects menus/parameters
3 Control knob VALUE, changes parameters
4 Control knob ARC for arc setting;
In MIG/MAG mode controls the arc voltage:
100%: optimal characteristic curve
up to 50%: short arc - less penetration
up to 150%: long/spray arc - deep penetration
In TIG AC mode controls the balance setting to adjust the rectifying effect.
5 Socket for external wire feed SDV 250 RC remote control;
computer interface.

3.2 Machine Start-Up

3.2.1 Selecting the Display Language

Switch machine on, then immediately turn knob ITEM counter-clockwise and knob ARC clockwise to activate the Language menu:

Pic. 4 Language menu

The currently selected language is highlighted. Turn knob VALUE to left or right to select the language you wish the display to show the menus/parameters. Available display languages are German (Deutsch) and English.

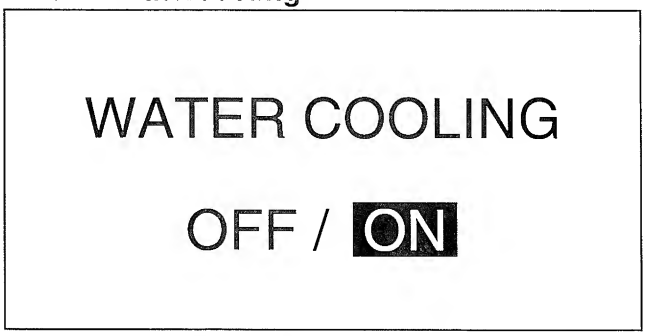
3.2.2 Selecting the Welding Process

After switching the machine on the Welding Process Select menu is displayed:

Pic. 5 Welding Process Select menu

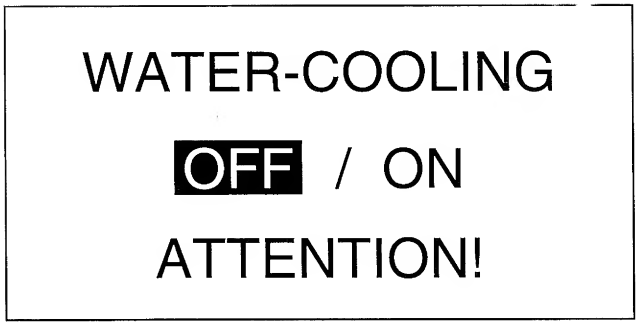
This is the first menu shown after power up (unless the Language menu was activated as per 3.2.2 above). The welding process active before the machine was switched off is highlighted.
Turn knob VALUE to select a different welding process or turn knob ITEM clockwise to immediately display the next menu.
If no action is taken, the next menu is shown after a 5 second delay.

3.2.3 Watercooling



Pic. 6 Watercooling menu

Next is the Watercooling menu. As both gas- or water-cooled torches can be used, the machine has to be set as required. With watercooling set ON, the fault detection device shuts the machine down if a fault is detected, and shows the cause in the display.
Turn knob VALUE to set the watercooling ON or OFF.
Turn knob ITEM to display the Active Welding Process menu.
If no action is taken, the next menu is shown after a 5 second delay.

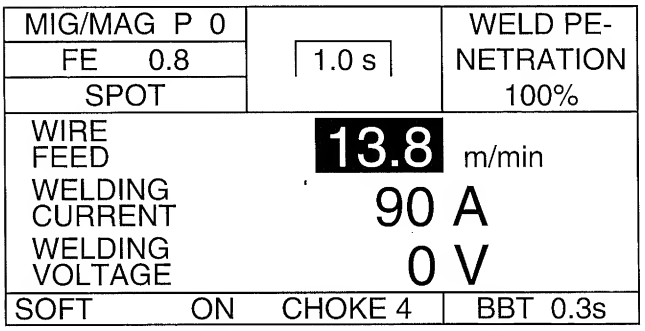


Pic. 7 Warning message watercooling

If watercooling is set OFF, a warning is displayed to warn the operator that the fault detection device is disabled and a water-cooled torch should not be operated.

If watercooling is set ON, the warning message is skipped and the Active Welding Process menu is displayed.

3.3 Menu MIG/MAG Welding



Pic. 8 Active Welding Process menu

Turn knob ITEM to select any of the available parameters. The selected parameter is highlighted. Turn knob VALUE to change the value of the highlighted parameter.
If no changes are made, the MWS Control will automatically activate the Wire Feed /Welding Current parameter after a 5 second delay, as this is the parameter most often adjusted when welding.

1) Parameter WIRE

Available selections:
- FE 0.6 mm
- FE 1.0 mm
- FE 1.2 mm
- FE 1.6 mm
- FLX 1.6 mm (flux-core wire)
- AL 1.0 mm
- AL 1.2 mm

It is very important to select the correct material and wire diameter in order for the processor to activate the correct current characteristics.

2) Parameter WELDING MODE

Available selections:
- 2-step
- 4-step
- Stitch welding
- Spot welding

2-step: Manual operation
Pressing the torch trigger starts the welding operation, releasing the switch stops the welding.

4-step: First operation of the trigger switch starts continuous operation, pressing the trigger switch again stops the welding.

Stitch weld: Particularly suitable for tack welding and intermittent seams. With stitch weld mode active the display shows two additional parameters, WELD-TIME and DWELL period. Highlight parameter with knob ITEM and set duration (in seconds) with knob VALUE.

Spot weld: With spot weld mode active the display shows the additional parameter WELD-TIME. Highlight with knob ITEM and set the weld-time (in seconds) with knob VALUE.
Pressing the trigger switch activates the welding operation for the preset weld-time period. For each spot weld the trigger switch has to be operated.

3) Parameter SOFT (automatic soft start)

Turn knob VALUE to set ON or OFF. If activated the parameter is highlighted.
While the arc has not yet ignited the filler material is fed very slowly to prevent excessive wire runout at the torch. When the arc starts the wire feed speed is automatically increased as required by the selected welding parameters. Changing the electrode wire does not require the automatic soft start to be set to off. If, after pressing the trigger switch, no welding current is sensed by the control, the automatic soft start is automatically disabled and the electrode wire can be run through the torch lead at normal speed. The automatic soft start should be disabled when working in spot weld mode.

4) Parameter WIRE FEED/WELDING CURRENT

This is the parameter most often needed by the operator. When not welding, the display shows the selected welding current and the corresponding wire feed speed in mtr per minute. The selected current must be regarded as approximate only, the actual welding current depends on several parameters like torch position, arc length, welding speed etc.
When the welding starts, the display changes to show the actual welding current and additionally the actual arc voltage. When the welding stops, these actual values are kept on display for approx. 2 seconds before the selected values are displayed again. This enables the operator to preset the required welding parameters and allows him check the actual values the welding operation was carried out with.

Because of the stepless electronic setting the operator only needs to select the required welding current, the computer automatically calculates the required wire feed speed. This requires that the correct current characteristics have been selected (parameter WIRE) and, for position welding or certain material specifications, the penetration has been corrected (control knob ARC). With the potentiometer ARC the arc voltage can be shifted to below or above the Program characteristic curve. 100% represent the optimal curve parameters (see also 8 Penetration below).

5) Parameter BACK-BURN TIMER/GAS POST-FLOW

A correctly set back-burn time keeps the electrode wire from sticking to the weld pool, and from forming a bead at the wire tip. It also regulates the gas post-flow time. Setting range 0 - 2 seconds.

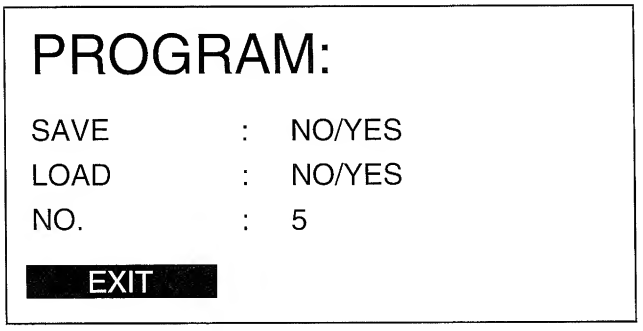
6) Parameter CHOKE

The Omega 400 SEK has an electronically controlled choke (ripple filter choke) to provide optimal welding behaviour in the short-arc welding range. As a result welding is practically spatter-free (for spray-arc welding the choke is not required).
In addition, the choke setting can be selected from 1 to 7 for a hard or soft arc. This allows the operator set the arc characteristic to suit his personal preference.

Setting 1 = hard arc
Setting 4 = regular arc
Setting 7 = soft arc

7) Parameter MIG/MAG P (programming/storing welding parameters)

When highlighted, turn knob VALUE to show the Program menu.



Pic. 9 Program submenue

For MIG/MAG welding 6 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item.
Select Program no. 1 - 6 by with knob VALUE.

Select NO/YES by turning knob VALUE clockwise.

To leave the Program submenue: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

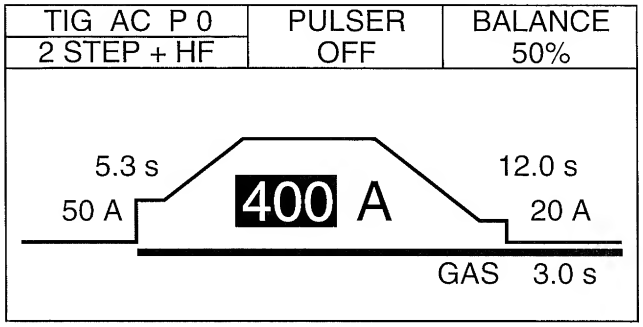
8) Weld Penetration (welding voltage)

Welding voltage fine tune gives, within certain limits, control over the automatically computed optimal wire feed speed. The penetration depth can be set from 150% (long or spray arc) to 50% (short arc). Even more important, the welding characteristics can be fine tuned for different welding positions or material specifications. The actual welding voltage is shown in the display during the welding operation.

To leave the MIG/MAG Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

3.4 Menu TIG AC Welding

Turn knob VALUE to highlight TIG-AC in the Welding Process Select menu as described in 3.2.2. Set the watercooling parameters if required, or switch with knob ITEM directly to the TIG AC Welding menu.



Pic. 10 TIG AC Welding menu

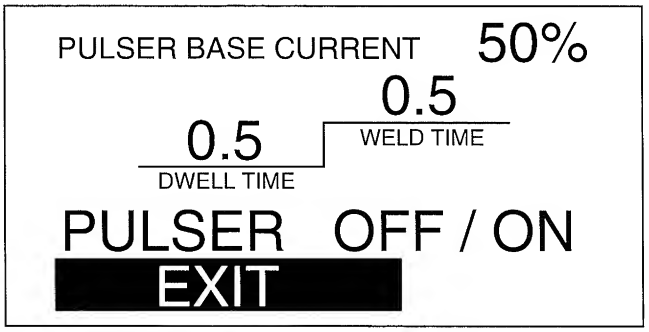
1) Parameter OPERATING MODE

Use knob VALUE to set operating mode.

Available selections:
2-step with H.F. (see 4.3.3 below)
4-step with H.F. (see 4.3.4 below)
Remote start
In remote start mode the arc can be started with the foot control unit, controlling the start-up with the torch controls is not necessary.

2) Parameter PULSE (pulsed arc welding)

Turn knob ITEM to highlight PULSE OFF (or PULSE ON if already activated), turn knob VALUE to toggle ON/OFF.



Pic. 11 Pulser submenue

Use knob ITEM to select a menu item, knob VALUE changes the parameter setting.
Pulser dwell time (base current):
setting range 0.1 - 10 seconds
Pulser weld time (welding current):
setting range 0.1 - 10 second
Pulser base current:
setting range 0 - 100%
The pulser base current is set as a percentage of the max. welding current, e.g. 100 A max. welding current and 50% pulser base current compare to 50 A current during pulser dwell time and 100 A for pulser weld time. The pulser base current is independent of the starting current setting.

Highlight EXIT to return to the main menu or wait 5 seconds for the HWS Control to return automatically. If the pulser is activated, both the pulser dwell and weld time are shown in the display.
See 4.3.5 below for more information on pulsed arc welding.

3) Parameter STARTING CURRENT (base current)

Setting range 5 - 400 A. The base current is used to heat up the material and to form a small weld pool, to prevent arc blow-through or material melting away at corners etc. If required, the base or starting current can be set higher as the actual welding current.

4) Parameter UP-SLOPE

Determines the time needed to slope up from starting current to the max. welding current.
Setting range 0 - 10 seconds.

5) Parameter WELDING CURRENT

Preselects the max. welding current. When not welding the selected value is displayed, during the welding operation the actual welding current is shown in the display.

6) Parameter DOWN-SLOPE

Sets the time for sloping down from max. welding current to the set base or end current.
Setting range 0 - 10 seconds.

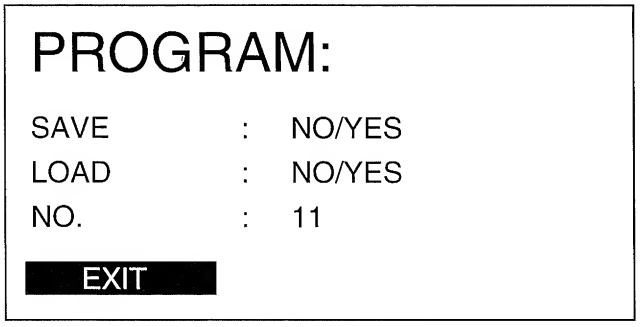
7) Parameter END CURRENT

The end current is set between 5 - 400 A, independent from starting current and pulser base current. This allows for an optimal end crater filling and closing of elongated pores.

8) Parameter GAS (gas post flow)

Setting range 0 - 20 seconds.

9) Parameter TIG AC P (programming/storing welding parameters)
When highlighted, turn knob VALUE to show the Program menu.



Pic. 12 Program submenue

For TIG AC welding 16 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item.
Select Program no. 1 - 16 by with knob VALUE.

Select NO/YES by turning knob VALUE clockwise.

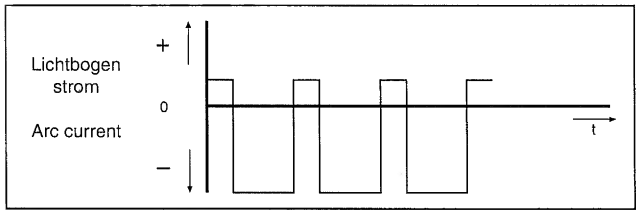
To leave the Program submenue: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

Program no. 0 contains the default settings and can not be overwritten or deleted. Recalling Program 0 sets the default settings for TIG AC welding.

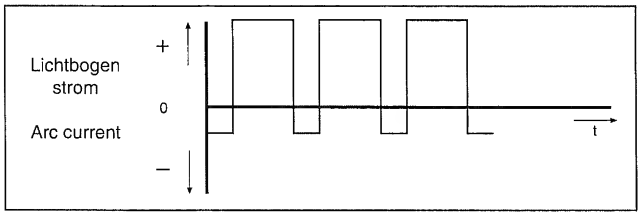
To leave the TIG AC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

10) Parameter BALANCE (balance control)
With the control knob ARC the balance can be adjusted at any time during a welding operation.
Tungsten Inert Gas welding of aluminium with alternating current generates a rectifying effect, causing the amplitudes of the square wave to be of different intensity. With the balance control this rectifying effect can be adjusted from +70% to -30%.

The negative amplitude is longer, giving deep weld penetration, with poor cleaning action.



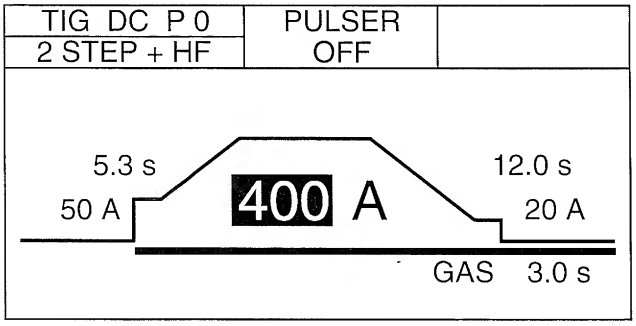
The positive amplitude is longer, giving less penetration, with good cleaning action.
Caution: Danger of overheating the electrode



For welding aluminium the standard setting is approx. 55-58%.

3.4 Menu TIG DC Welding

Turn knob VALUE to highlight TIG DC in the Welding Process Select menu as described in 3.2.2. Set the watercooling parameters if required, or switch with knob ITEM directly to the TIG DC Welding menu.



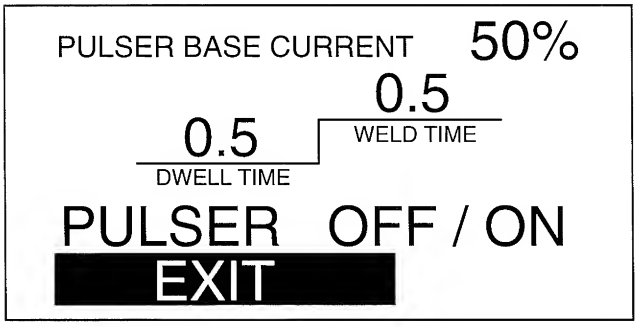
Pic. 13 TIG DC Welding menu

1) Parameter OPERATING MODE
Use knob VALUE to set operating mode. Available selections:

2-step with H.F. (see 4.3.3 below)
4-step with H.F. (see 4.3.4 below)
Remote start

In remote start mode the arc can be started with the foot control unit, controlling the start-up with the torch controls is not necessary.

2) Parameter PULSE (pulsed arc welding)
Turn knob ITEM to highlight PULSE OFF (or PULSE ON if already activated), turn knob VALUE to toggle ON/OFF.



Pic. 14 Pulser submenue

Use knob ITEM to select a menu item, knob VALUE changes the parameter setting.
Pulser dwell time (base current):
setting range 0.1 - 10 seconds
Pulser weld time (welding current):
setting range 0.1 - 10 second
Pulser base current:
setting range 0 - 100%
The pulser base current is set as a percentage of the max. welding current, e.g. 100 A max. welding current and 50% pulser base current compare to 50 A current during pulser dwell time and 100 A for pulser weld time. The pulser base current is independent of the starting current setting.

Highlight EXIT to return to the main menu or wait 5 seconds for the HWS control to return automatically. If the pulser is activated, both the pulser dwell and weld time are shown in the display.
See 4.3.5 below for more information on pulsed arc welding.

3) Parameter STARTING CURRENT (base current)
Setting range 5 - 400 A. The base current is used to heat up the material and to form a small weld pool, to prevent arc blow-through or material melting away at corners etc. If required, the base or starting current can be set higher as the actual welding current.

4) Parameter UP-SLOPE
Determines the time needed to slope up from starting current to the max. welding current.
Setting range 0 - 10 seconds.

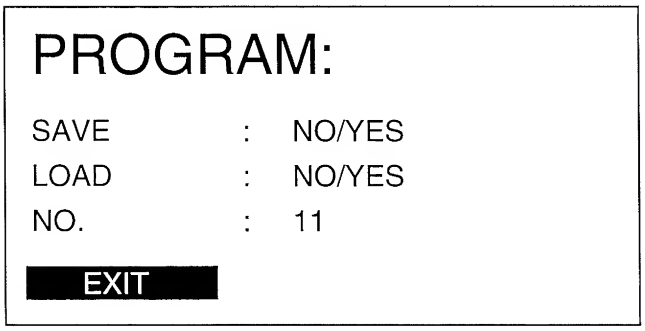
5) Parameter WELDING CURRENT
Preselects the max. welding current. When not welding the selected value is displayed, during the welding operating the actual welding current is shown in the display.

6) Parameter DOWN-SLOPE
Sets the time for sloping down from max. welding current to the set base or end current.
Setting range 0 - 10 seconds.

7) Parameter END CURRENT
The end current is set between 5 - 400 A, independent from starting current and pulser base current. This allows for an optimal end crater filling and closing of elongated pores.

8) Parameter GAS (gas post flow)
Setting range 0 - 20 seconds.

9) Parameter TIG DC P (programming/storing welding parameters)
When highlighted, turn knob VALUE to show the Program menu.



Pic. 15 Program submenue

For TIG DC welding 16 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item.
Select program no. 1 - 16 by with knob VALUE.

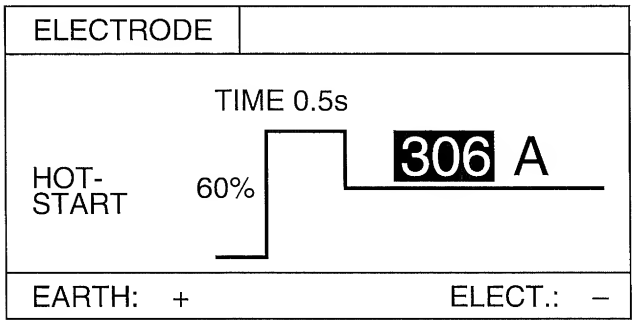
Select NO/YES by turning knob VALUE clockwise.

To leave the Program submenue: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

Program no. 0 contains the default settings and can not be overwritten or deleted. Recalling Program 0 sets the default settings for TIG AC welding.

To leave the TIG DC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

3.6 Menu MANUAL ARC Welding



Pic. 16 MANUAL ARC Welding menu

1) Parameter TIME
Controls the length of time the hotstart is active. Setting range 0 - 2.0 seconds.

2) Parameter HOTSTART
Controls the amount of hotstart current, range is 0 - 100%. The selected percentage is added to the selected welding current, e.g. with a setting of 100 A welding current, hotstart 50% and time 0.5 sec the machine starts the arc with 150 A for 0.5 sec.

3) Parameter WELDING CURRENT
Setting range 5 - 400 A.

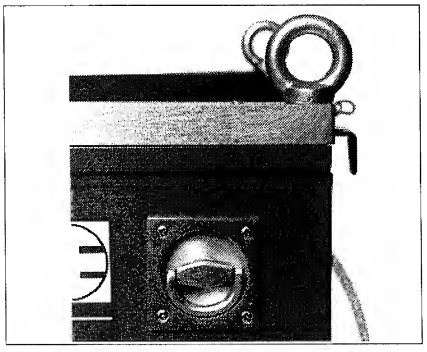
4) Parameter POLARITY
Changes the polarity of earth cable and electrode holder, without the need to interchange the cables on the machine.

To leave the MANUAL ARC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

4.0 General Instructions for Machine Start-Up

4.0.1 Transportation

The machine is fitted with two rigid and two swivel casters to facilitate transportation on level ground. Moving the machine on sloping ground requires additional measures to keep it safely manoeuvrable.
Use all four lifting eyes when hoisting by crane.
Prior to all movement of the machine the gas cylinder should be secured safely to keep it from tipping over. Remove cylinder for crane hoisting.



Pic. 17 Lifting eyes

4.0.2 Connection of Gas Cylinders

On the rear housing panel two shielding gas supply hoses are led into the machine, each controlled by a solenoid valve. Each hose is clearly marked with the welding process for which it supplies the shielding gas. There is also a gas cylinder bracket, which holds two gas cylinders side by side, keeping them from tipping over when secured with the chains provided.

4.0.3 Connection to Power Mains

This welding machine will only operate on the voltage stated on the machine label. The power cable is factory installed , in which order phases are connected is irrelevant and does not affect the direction of rotation of cooling fan and coolant pump.
Important: Be sure that water cooling unit is filled with coolant before switching machine on.

4.1 MIG/MAG Welding

For setting of MIG/MAG welding parameters with the MWS Control see 3.3 above.

4.1.0 Standard Values for MIG/MAG Welding Current Selection

1. MIG welding of butt welds on unalloyed and low-alloy steels

Material thickness mm	Weld type	Groove angle °	Gap width mm	Root face mm	Electrode wire Ø mm	Welding current A	Arc voltage V	Number of layers
2	I	-	0	2.0	0.8	110	20	1
4	I	-	0	4.0	1.2	170	22	1
5	I	-	0	5.0	1.6	200	25	1
5	Y	70	0	1.5	1.6	160	22	1
6	Y	-	0	6.0	1.6	230	26	1
6	Y	70	0	1.5	1.6	170	22	1
8	Y	70	0	1.5	1.6	1. L 220 2. L 220	26 26	1 2
10	Y	60	0	2.0	1.6	1. L 220 2. L 200 G 230	26 26	1 2
12	Y	60	0	1.5	1.2	1. L 240 2. L 220 G 250	26 26	1 2

Electrode wire: same material as workpiece
Shielding gas: Argon
1.L: first layer
2.L: second layer
G: back weld

2. MAG welding of fillet welds on unalloyed and low-alloy steel

Actual throat mm	Welding position	Electrode wire Ø mm	Welding current A	Arc voltage V	Number of layers
1.0[1)]	f, h	0.8	65	17.0	1
1.0[1)]	vd	0.8	65	17.0	1
1.5[1)]	f, h	0.8	115	18.0	1
1.5[1)]	vd	0.8	115	18.0	1
2.0	f, h	0.8	130	19.0	1
2.0	vd	0.8	100	19.5	1
3.0	h	1.0	215	22.5	1
3.0	vd	1.0	210	21.5	1
4.0	f, h	1.0	220	23.0	1
4.0	vd	1.2	220	20.0	1
4.0	h	1.2	280	28.0	1
5.0	h	1.2	300	29.5	1
5.0	vd	1.2	190	19.5	3
6.0	h	1.2	300	29.5	1
6.0	vu	1.0	115	17.5	1
8.0	h	1.2	300	29.5	3
8.0	vu	1.0	130	18.5	2
10.0	h	1.2	300	29.5	4
10.0	vu	1.2	165	19.0	2
10.0	h	1.6	380	34.0	3

[1)] Fillet welds on thin-plate w/o measured dimension "a"

Electrode wire: SG-2/SG-3
Shielding gas: mixed gas
Welding positions: f = flat
h = horizontal
vd = vertical down
vu = vertical up

3. MAG welding of butt welds on unalloyed and low-alloy steels

Material thickness mm	Weld type	Groove angle°	Gap width mm	Welding position	Electrode wire Ø mm	Welding current A	Arc voltage V	Number of layers
1.0	I	-	0	f, h	0.8	70	18.0	1
1.5	I	-	1.0	f, h	0.8	90	17.0	1
2.0	I	-	1.0	f	1.0	125	18.5	1
2.0	I	-	1.5	vd	0.8	130	18.5	1
3.0	I	-	1.5	f	1.0	130	19.0	1
3.0	I	-	2.0	vd	1.0	130	19.0	1
4.0	I	-	2.0	f	1.0	135	19.0	1
4.0	I	-	2.5	vd	1.0	160	20.0	1
5.0	V	50	2.0	f	1.0	R 125 C 200	18.5 21.0	2
5.0	V	50	2.0	vd	1.0	R 130 C 170	18.5 19.5	2
6.0	V	50	2.0	f	1.0	R 125 C 205	18.5 21.0	2
6.0	V	50	2.0	vd	1.0	R 130 C 170	18.5 19.5	2
8.0	V	50	2.0	f	1.2	R 135 F 270 C 270	18.0 27.5 27.5	3
8.0	V	50	2.0	vu	1.0	R 100 C 100	17.0 17.0	2
10.0	V	50	2.5	f	1.2	R 135 F 290 C 290	18.5 28.0 28.0	3
10.0	V	50	2.5	vu	1.0	R 120 C 120	18.0 18.0	2
12.0	V	50	2.5	f	1.2	R 135 2 x F 290 C 290	18.5 28.0 28.0	4
12.0	V	50	2.5	vu	1.0	R 100 F 135 C 135	17.5 18.5 18.5	3
15.0	V	60	1.0	f	0.8 1.2 1.2	R 110 2 x F 270 C 270	21.0 27.0 27.0	4
15.0	V	50	3.0	vu	1.2	R 130 F 160 C 160	18.5 19.5 19.5	3

R = root pass
F = filler pass
C = cover pass

electrode wire: SG-2/SG-3
Shielding gas: mixed gas

4. MAG welding of fillet welds on unalloyed and low-alloy steels

Actual throat mm	Welding position	Electrode wire Ø mm	Welding current A	Arc voltage V	Number of layers
1.00[1)]	f, h	0.6	55	20.0	1
1.00[1)]	vd	0.6	60	21.0	1
1.50[1)]	h	0.9	135	22.0	1
1.75[1)]	h	0.8	100	21.0	1
1.75[1)]	vd	0.8	90	21.0	1
2.0[1)]	h	1.0	175	21.0	1
2.0[1)]	vd	0.8	140	23.0	1
2.5	vd	1.0	210	19.0	1
3.0	vd	1.2	190	20.5	1
3.5	h	1.0	230	27.0	1
3.5	vd	1.2	195	20.0	1
4.0	h	1.2	240	24.0	1
5.0	h	1.2	320	32.0	1

[1)] Fillet welds on thin-plate without measured dimension "a"

Electrode wire: SG-/SG-3
Shielding gas:carbon dioxide

Welding positions: f = flat
h = horizontal
vd = vertical down
vu = vertical up

5. MAG welding of butt welds on unalloyed and low-alloy steels

Material thickness mm	Weld type	Groove angle °	Gap width mm	Welding position	Electrode wire Ø mm	Welding current A	Arc voltage V	Number of layers
0.75	I	-	0	f	0.8	55	20.0	1
0.75	I	-	0	vd	0.9	140	20.0	1
1.0	I	-	0	f	0.8	85	19.5	1
1.0	I	-	0	vd	0.9	120	21.0	1
2.0	I	-	0.3	f	0.9	135	22.0	1
2.0	I	-	1.0	f	0.8	80	19.0	1
2.0	I	-	1.0	vd	0.8	80	19.0	1
3.0	I	-	1.5	f	1.0	100	19.0	1
4.0	I	-	1.7	f	1.0	130	20.0	1
4.0	I	-	2.0	vd	1.0	130	20.0	1
6.0	V	60	1.7	f	1.2	150	21.0	2
6.0	V	60	1.7	vd	1.2	150	20.0	2
8.0	V	60	1.7	f	1.2	150	21.0	2
10.0	V	60	1.7	f	1.2	150	21.0	3
10.0	V	60	1.7	R = vd C = vu	1.2	150	20.0	2
15.0	V	60	1.7	f	1.2 1.6 1.6	R 150 2 x F 350 C 350	21.0 31.0 31.0	4
15.0	X	60	1.7	vu	1.2 1.2	2 x F 150 2 x C 150	20.0 20.0	4
15.0	V	60	1.0	vu	0.8 1.0 1.0	R 110 2 x F 120 C 120	21.0 22.0 22.0	4

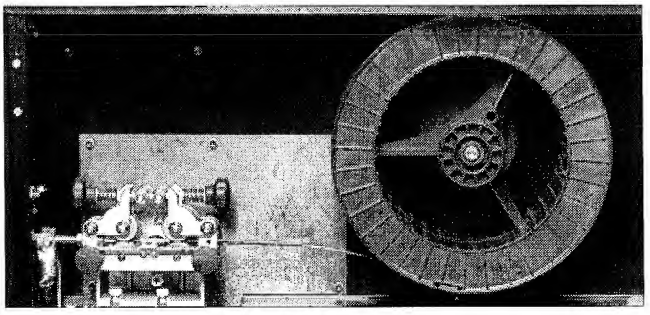
R = root pass
F = filler pass
C = cover pass

Electrode wire: SG-2/SG-3
Shielding gas:carbon dioxide

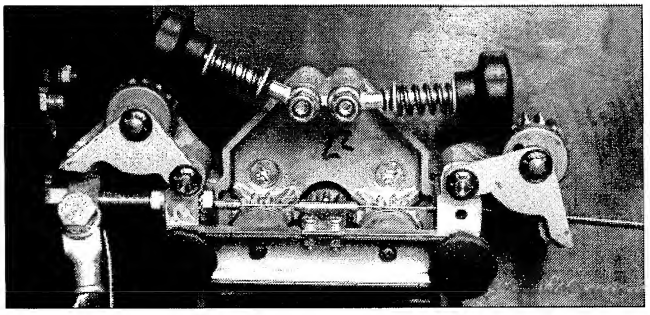
Welding positions: f = flat
h = horizontal
vd = vertical down
vu = vertical up

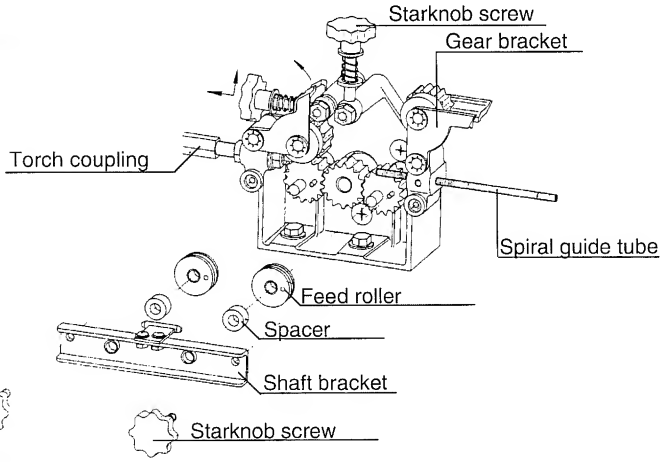
4.1.1 Installing the Wire Spool

Place wire spool onto spool carrier so that wire runs off clockwise. The spool carrier is equipped with a brake, which can be adjusted by means of a hex. socket head cap screw. Set brake so spool does not idle after wire feed stops, to prevent the wire from coming loose and falling off the spool.



Pic. 18 Wire feed unit





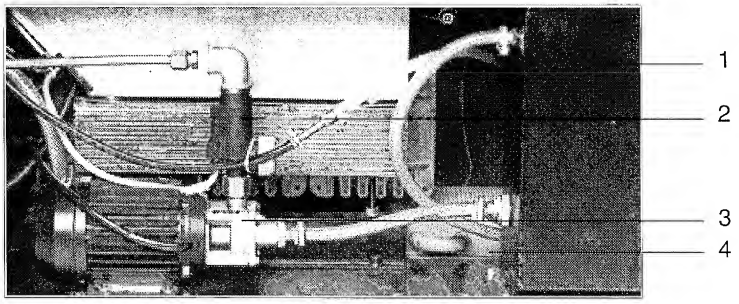
Pic. 19 Opened wire feed drive & exploded view drawing

Loosen starknob screws and open gear brackets. The feed rollers are factory installed for use of 1.0/1.2 mm Ø wire (for 0.6/0.8 mm Ø wire the feed rollers must be reversed on the shaft). Insert deburred wire into spiral guide tube, place over first feed roller into guide tube of bracket, then across second feed roller into the Euro-connector. Close gear brackets and tighten starknob screws, setting just slightly more pressure to the feed roller feeding into the Euro-connector, to ensure a smooth wire feed.

Remove gas shroud by turning clockwise, and contact tip by turning counter-clockwise. Set mains switch (2) to ON and activate the torch's trigger switch until the wire protrudes approximately 2 cms from the swan neck. Reinstall contact tip and gas shroud.
The Omega 400 is shipped set for 1.2 mm Ø wire. If a different wire diameter is used the steel liner and contact tip have to be changed to match the wire diameter.

4.1.2 Water Cooling/Coolant

Machines with refrigerating unit are supplied with coolant already filled into the unit. This coolant is mixed with antifreeze, providing protection to - 15°C/+ 5°F. Check the coolant level regularly, a low coolant level may cause damage to the torch. The MWS Control indicates a low coolant level in the display (see section 7 Error Messages below).



Pic. 20 Water cooling unit

1. Coolant tank, approx. 7.2 ltr
2. Flow control
3. Coolant pump
4. Heat exchanger

The Omega 400 SEK series has the water cooling system integrated into the machine housing. The coolant tank is accessed for refilling through the wire feed cabinet door. A flow control meter constantly monitors the correct function of the cooling system. A low coolant level or reduced flow rate (clogged torch lead lines) is indicated on the MWS Control display (see section 7 Error Messages).

4.1.3 Earth Cable

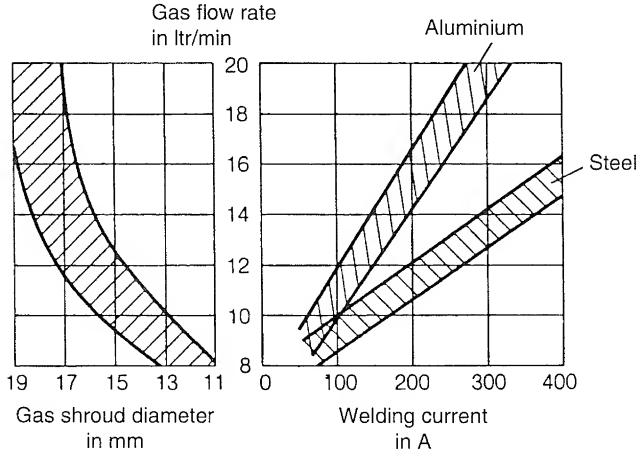
Connect earth cable plug to Earth Cable Socket (8) on the machine's front panel. Use only genuine Elektra parts with recommended cross sections. Structural components, beams, pipes or rails should not be used for earth conduction, if they are not the actual workpiece. When using welding tables or jigs ensure proper conducting.

4.1.4 Gas Flow Setting

The correct amount of shielding gas, and a steady gas flow at the welding seam, is essential to provide sufficient shielding of the weld pool. Insufficient shielding causes porous welding seams.

Rule of thumb to calculate the required shielding gas flow rate:
Amount of gas in ltr/min = 10 x the electrode wire diameter in mm
Example: Wire diameter 1.0 mm requires a gas flow rate of 10 ltr/min.

Diagram showing the exact gas flow rate required, accounting for different welding current settings



4.1.4 Settings

The OMEGA 400 SEK welding machines are equipped with the intelligent MWS Control. After selecting the electrode wire use and the desired welding current, a single-chip micro-processor automatically sets the optimal wire feed speed and welding voltage. The root or weld penetration can be corrected by setting the parameter PENETRATION as required. 100% is the default setting suitable for most applications.

More penetration - higher welding voltage up to 150%
Less penetration - lower welding voltage down to 50%

The back-burn timer should be set so that the bead at the tip of the electrode wire protrudes approximately 5 mm from the contact tip.
The automatic soft start sets the wire feed speed to 100% only after the arc has started. This prevents excessive spattering and wire sticking in the start cycle. For spot welding and electrode wire changing the automatic soft start should be disabled.

4.1.6 Aluminium (MIG-Welding)

When welding aluminium replace the standard torch components with the following:

— cylindrical gas shroud
— contact tip "A"
— PA- liner c/w copper spiral liner
— support tube

The feed roller has to be set to match the wire diameter, otherwise the wire will kink. The electrode wire must match the material specification (pure aluminium or alloy). A pure inert shielding gas is required, gas flow rate 10 - 13 ltr/min.

1. Disconnect torch lead assembly from machine and remove electrode wire.
2. Place aluminium wire spool onto spool carrier.
3. Remove liner collet from the torch lead's central coupling and pull steel liner from torch lead assembly.
4. Remove gas shroud and contact tip from torch.
5. Fit PA liner into central coupling and push through lead assembly until liner protrudes from the head stock. Insert copper spiral into headstock and push into swan neck until flush, then install contact tip "A". The copper spiral liner prevents the Teflon liner from getting too hot and possibly melting.
6. Secure PA liner in place by replacing the liner collet at the central coupling.
7. For PA liners with 4.0 mm outer diameter the steel capillary tube of the wire feed unit has to be replaced by the support tube. For PA liners with 4.7 mm outer diameter no support tube is required.
8. Attach torch lead assembly to machine and cut off the PA liner just in front of the feed roller.
9. The cut-off liner piece is installed between the wire spool and wire feed unit, to provide for easy guiding here too.
10. To thread the aluminium wire into the lead assembly temporarily remove the contact tip. Thread wire into liner. Set guide rollers to match wire diameter and pressure roller to only minimal pressure, so it will not flatten the wire by excessive pressure. Let wire run through lead assembly until it shows 2-3 cms at the headstock.
12. Replace contact tip and gas shroud.

Welding aluminium requires a pure inert gas, such as Argon or Helium. The minimum electrode wire diameter recommended is 1.0 mm. Forehand welding is recommended to keep the seam from tarnishing.
The following aluminium welding conversion kits are available:

Electrode Ø	**Stock-no.**		**Stock-no. for polyamid liner**	
			3 mtr	**4 mtr**
0.8 mm	090 200 1514			
1.0-1.2 mm	090 200 1522	0.8 - 1.2 mm	132 714 4550	132 714 4541

4.1.7 Stainless Steel

As with aluminium, a pure inert shielding gas is required. Setting of the welding current as with carbon steel. Prepare torch lead assembly for aluminium welding, but use standard contact tip and conical gas shroud. Recommended gas flow rate 13 - 14 ltr/min. To prevent a porous weld seam forehand welding is recommended.

4.1.8 High-Alloy Steel

High-alloy steels can be welded just like regular low-carbon steels without problems by setting the electrode wire diameter to the wire diameter used. For the correct shielding gas refer to the material specifications.
When welding with Stellite electrode wire Ø1.6 mm use a pure inert gas. Set parameter WIRE to FLX(1.6).
It is recommended to use a polyamid liner when welding with high-alloy filler metals.

4.1.9 Flux-Core Electrode Wire

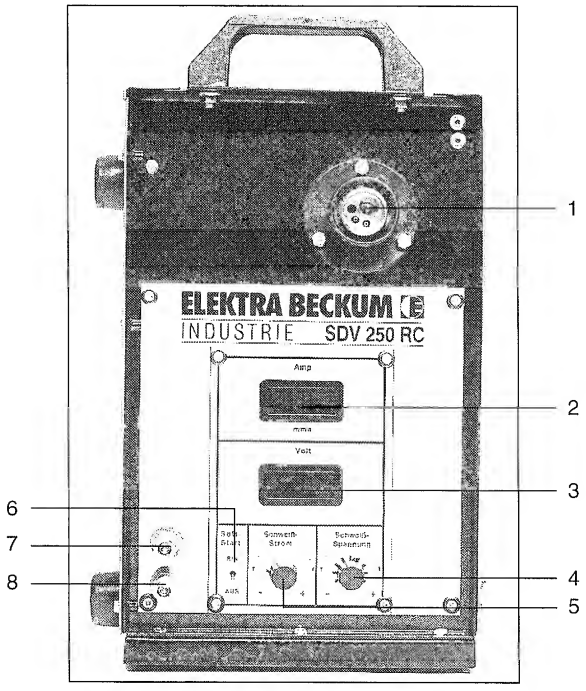
Using pure Argon as shielding gas when welding with flux-core electrode wire produces a better weld.

4.2 MIG/MAG Welding with Separate Wire Feed

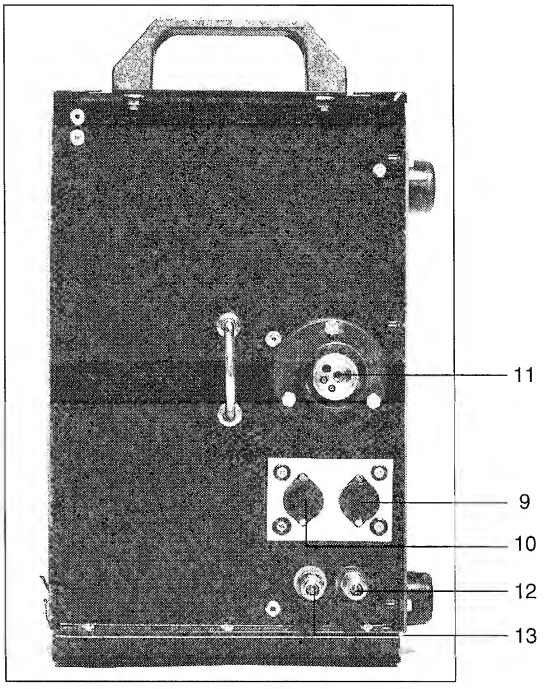
Model OMEGA 400 SEK/W X, which does not have an internal wire feed unit, can be adapted to MIG/MAG welding with a separate wire feed unit and a torch lead extension.

A separate wire feed unit can also be connected to model OMEGA 400 SEK/W, using a torch lead extension.

4.2.1 SDV 250 RC Controls



Pic. 21 Front panel



Pic. 22 Rear view

1 Euro-Connector for MIG/MAG Welding Torch Leads

2 Digital Welding Current Display (A) and actual Wire Feed Speed m/min.
While the welding power source is switched on the current wire feed speed is displayed in meters per minute. When the welding process starts, the display changes to show the selected welding current in amps.

3 Digital Welding Voltage Display (V)

4 Welding Voltage Fine Tuning
Adjusts the automatically set welding voltage. The weld penetration can be corrected to both + and - (long or short arc), but more important the welding characteristics can be fine tuned for different welding positions or material specifications. The currently selected welding voltage is displayed in the digital display [3].

5 Stepless Welding Current Setting
Sets the welding current steplessly from minimum to maximum. Depending on the MWS Control electrode wire parameter setting, the wire feed speed is kept within the computed, optimal range. If required, the wire feed speed can be adjusted with potentiometer [4].

6 Automatic Soft Start ON/OFF
While the arc has not yet ignited the filler material is fed very slowly to prevent excessive wire runout at the torch. When the arc starts, the wire feed speed is automatically increased as required by the selected welding current. When changing the electrode wire or operating in spot-weld mode, the automatic soft start should be disabled.

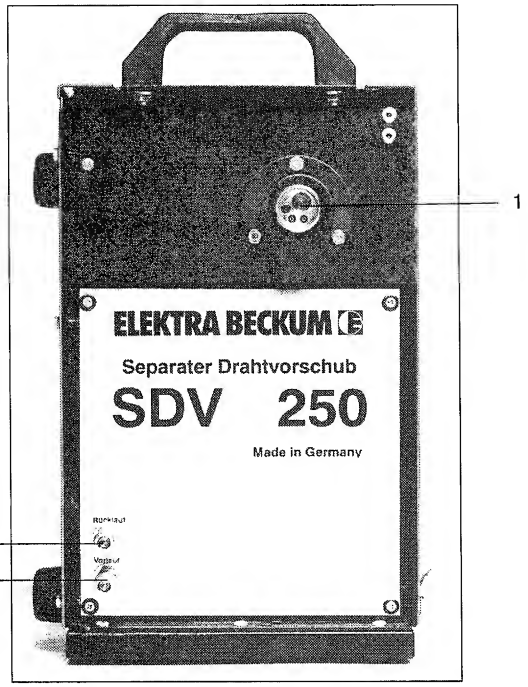
7/8 + 12/13 Torch Coolant Couplings

9 Socket for Electronic Control Leads

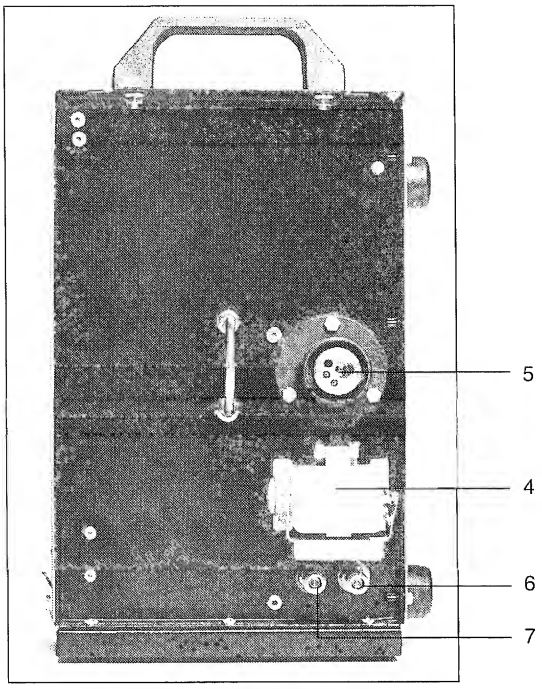
10 Socket for Motor Leads

11 Euro-Connector - Torch Leads Extension

4.2.2 SDV 250 E Controls



Pic. 23 Front view

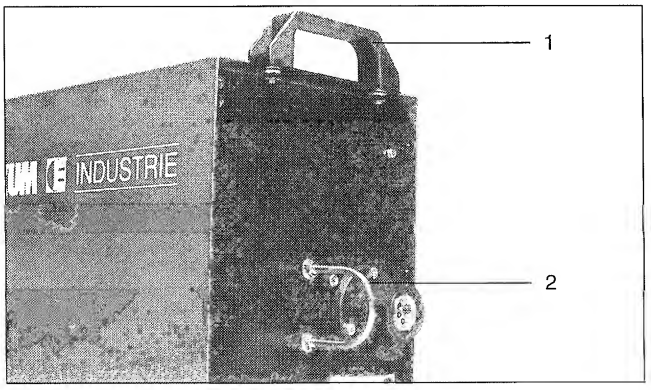


Pic. 24 Rear view

1 Euro-Connector for MIG Welding Gun Leads
2/3/6/7 Torch Coolant Couplings
4 Socket for Motor Leads (requires Adapter E/SEK, stock-no. 090 201 1285)
5 Euro-Connector for Torch Lead Extension

4.2.3 General Instructions for Start-Up
4.2.4 Transportation

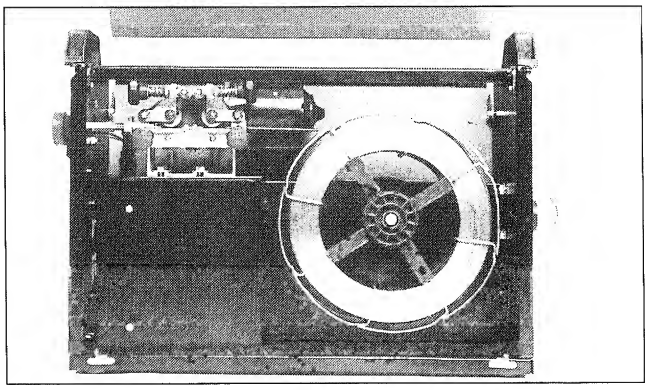
The Separate Wire Feed Unit can be fitted with a rotating mount to install it on top of the welding machine. Handles [1] and jack rings [2] provide for easy transportation.



Pic. 25 View of transport facilities

4.2.5 Installing the Wire Spool

Place wire spool onto spool carrier so that wire runs off clockwise.
The spool carrier is equipped with a brake, which can be adjusted by means of a hex. socket head screw. Set brake so that wire spool does not idle after wire feed is switched off, to prevent the wire from coming loose and falling off the spool.



Pic. 26 View of wire feed unit

4.3 TIG Welding

Both welding power sources OMEGA 400 SEK/W and 400 SEK/WX are suitable for TIG DC welding of steel, nickel-chromium steel and NF-metals, and for TIG AC welding of aluminium and aluminium alloys.
TIG AC welding is always done with a high-frequency arc. The arc is started with direct current, then immediately switched to an absolutely square wave alternate current.

4.3 Standard Values for TIG Welding

Plain and alloyed steel

DC; negative electrode polarity; welding position f; butt weld

Material thickness mm	Weld type	No. of layers	Diameter of		Welding current A
			Electrode mm	Welding rod mm	
1.0	II	1	1 or 1.6	1.6 or 2.0	30 ... 40
2.0	II	1	1.6 or 2.4	1.6 or 2.0	70 ... 80
3.0	II	1 or 2	2.4	2.4	70 ... 90
4.0	II or V	2	2.4	2.4	70 ... 130
5.0	V	3	2.4 or 3.2	2.4 or 3.0	75 ... 130
6.0	V	3	2.4 or 3.2	2.4 or 3.0	75 ... 130

Aluminium

AC; negative electrode polarity; welding position f; butt weld

Material thickness mm	Weld type	No. of layers	Diameter of		Welding current A
			Electrode mm	Welding rod mm	
1.0	II	1	1.6 or 2.4	2.0	40 ... 50
2.0	II	1	1.6 or 2.4	3.0	60 ... 80
3.0	II	1	2.4	3.0	110 ... 130
4.0	II	1 or 2	2.4 or 3.2	3.0	120 ... 150
5.0	V	1 or 2	3.2	3.0	150 ... 200

Copper

DC; negative electrode polarity; welding position f; butt weld

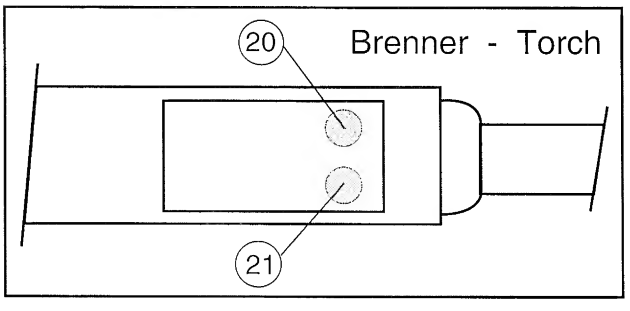
Material thickness mm	Weld type	No. of layers	Diameter of		Welding current A
			Electrode mm	Welding rod mm	
1.5	II	1	1.6	2.0	90 ... 100
3.0[1)]	II	1	3.2	3.0	150 ... 200
5.0[1)]	V	2	4.0	4.0	180 ... 300

[1)] = preheating required

Note: For vertical down and overhead welding positions reduce welding current by 10 - 20%.

4.3.1 TIG Torch Connection

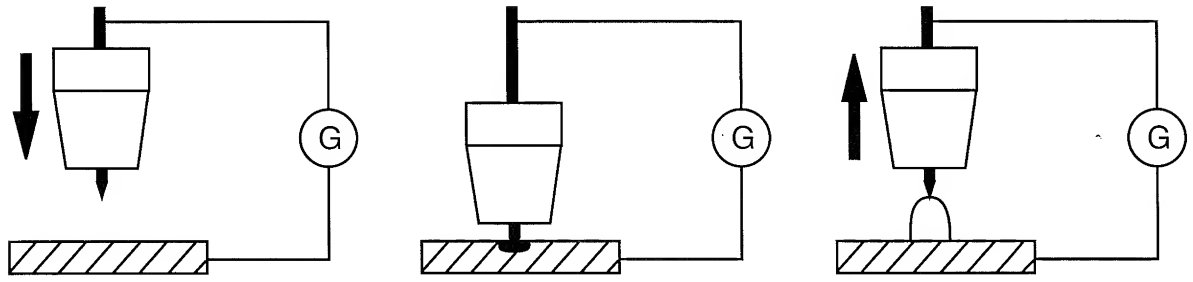
The welding current lead connects to socket [12], the pilot leads to socket [10]. The gas hose connects to the quick coupling [11] and the work piece clamp to socket [8]. In addition a foot-operated remote control unit can be connected to socket [9]. The set welding current can also be regulated with the potentiometer build into the torch. If required, the arc can be started through the foot control unit.



Note: If both a foot control unit and a torch with remote control potentiometer are connected to the machine, they will interfere with each other. Always connect only one remote control device.

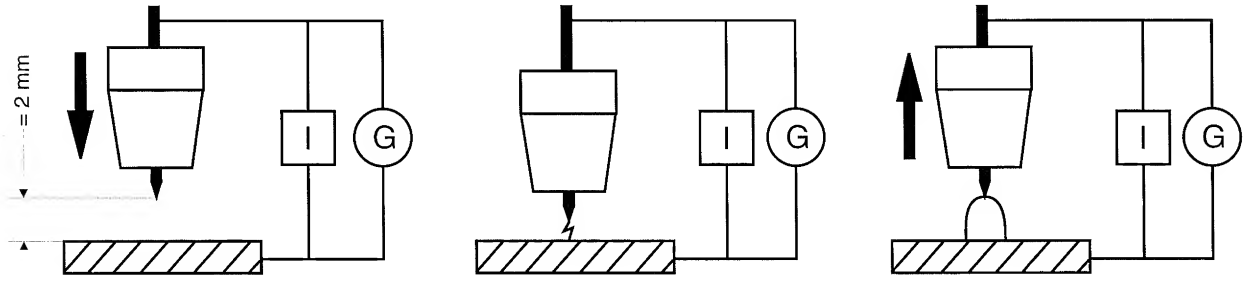
4.3.2 Arc Starting

4.3.2.1 Arc Starting by Touching the Work Piece with the Electrode (Scratch Start)



Approaching the work piece | Short circuit and heating up | Ignition of the arc

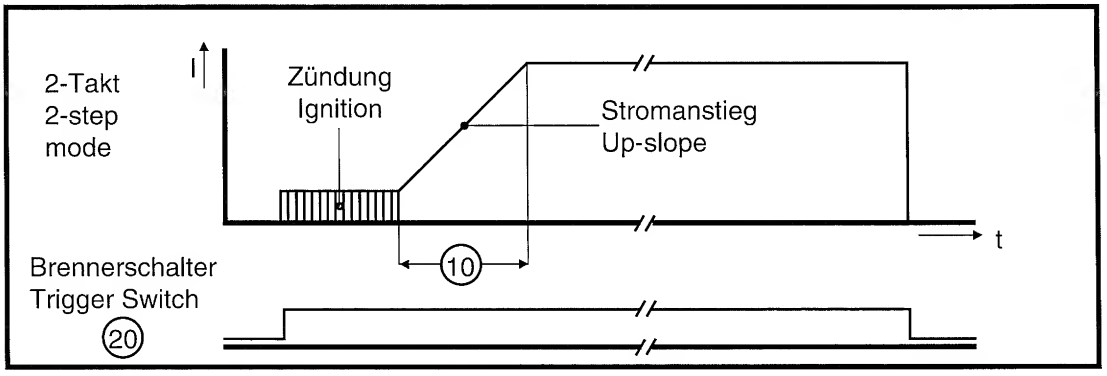
4.3.2.2 Touch-free High-Frequency Arc Starting



Approaching the work piece | Starting the pilot arc by high-frequency pulses | Ignition of the arc

4.3.3 2-Step Mode

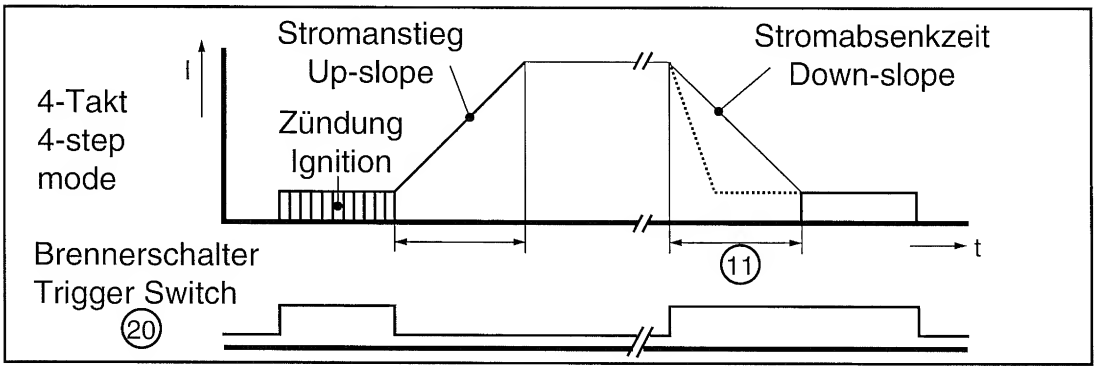
Pressing the red trigger switch [20] starts the welding operation. After the arc has started (by either H.F. or touch-contact ignition), the welding current slopes up from the selected base current to the set welding current. The base current is set with the MWS Control. The duration of the slope-up time is set with the MWS Control between 0 - 10 sec.
When releasing the trigger switch [20] the arc extinguishes immediately.

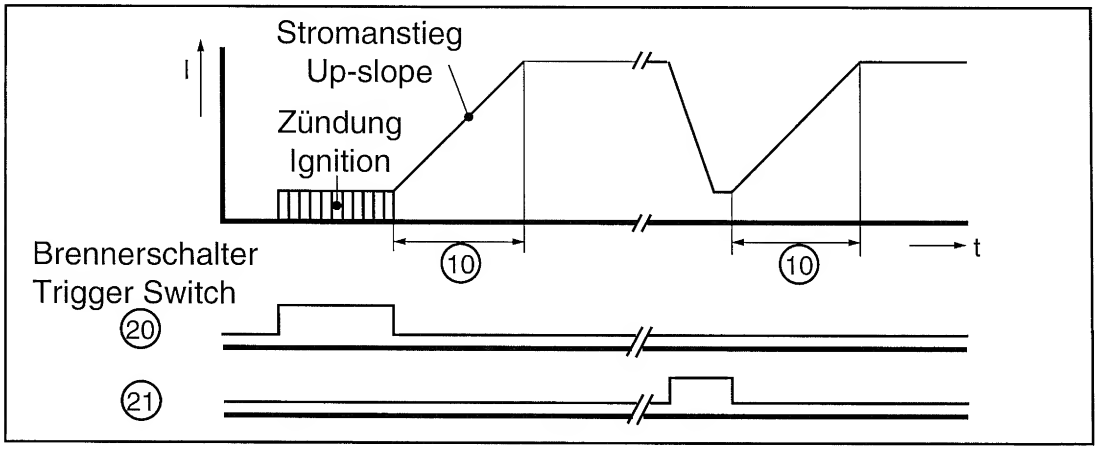


4.3.4 4-Step Mode

Pressing the red trigger switch [20] starts the welding operation (ignition either by H.F. or touch-contact ignition). While the trigger switch is held down, the arc operates at the base current. The base current is set as with the 2-step mode, but should be set to a minimum of 5 A (pilot arc). After the trigger switch is released, the welding current slopes up to the selected welding current, within the preset period (0.1 - 10 sec) . Pressing the trigger switch [20] again engages the slope-down function, the welding current, within the preset time, slopes down to the selected end current for end crater filling. Releasing the trigger switch ends the welding operation.

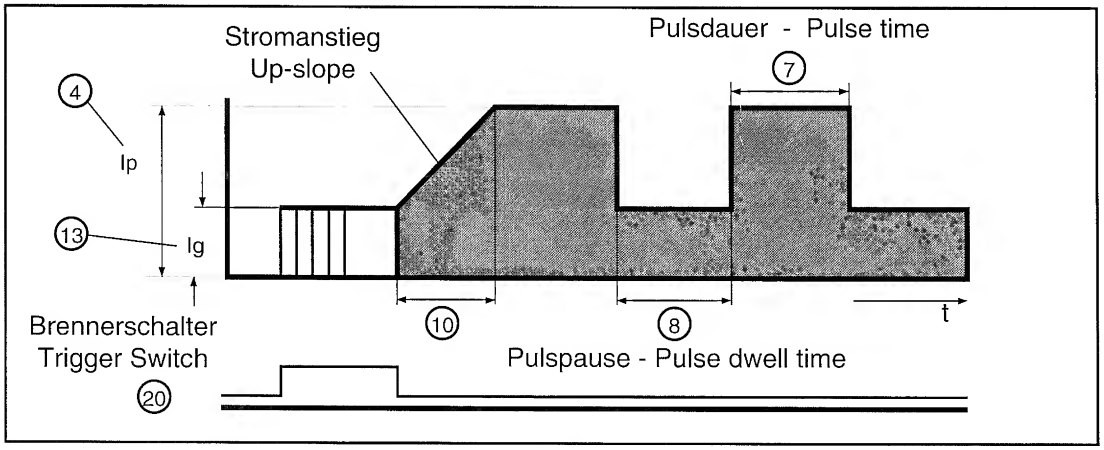
Activating the green button [21] at any given time during the welding operation reduces the welding current to the selected base current without interrupting the welding operation. Releasing the green button lets the current slope up again to the pre-selected welding current.





4.3.5 Pulsed Arc Welding

For pulsed arc welding the arc operates at an infinitely adjustable pulse base current (adjustable from 0% - 100% of the pulsed arc (welding) current). This pulse base current is independent of the base current.
The pulsed arc current is set in the MWS Control TIG Welding Pulser submenue, as are the pulser dwell and weld time parameters, each steplessly adjustable between 0 - 10 sec.



Advantages:

- welding of very thin material
- high energy input per unit length when welding high-alloy steels
- joining of thick with thin material

4.3.6 Practical Hints For Operation

To ensure good arc starting and good welding results the following should be adhered to:

4.3.6.1 Electrode Types

For DC TIG welding only thoriated electrodes are recommended for use, e.g.

WT 20 1.8-2.2 % thorium oxide, color code: red
WT 30.2.8-3.2 % thorium oxide, color code: green

4.3.6.2 Current-Carrying Capacities of Tungsten Electrodes

Diameter	Welding Current with			Gas Shroud	
	Direct Current (negative electrode polarity) with 2% Thorium[1]	Alternating Current with Filter Capacitor [2] (negative electrode polarity)		Size	Diameter
		Pure Tungsten	with 2% Thorium		
mm	A	A	A		mm
1.0	... 80	... 30	30 ... 60	4 ... 5	6.5 ... 8
1.6	10 ... 140	30 ... 70	40 ... 100	4 ... 6	6.5 ... 9.5
2.4	20 ... 230	50 ... 110	70 ... 150	6 ... 8	9.5 ... 12.7
3.2	30 ... 310	100 ... 170	130 ... 200	7 ... 8	11.2 ... 12.7
4.0	40 ... 400	160 ... 200	170 ... 250	8 ... 10	12.7 ... 15.9

[1] for pure tungsten electrodes the upper values are approx. 40 % lower
[2] without balance the values shown are approx. 50 % higher

Note: Tungsten electrodes must be clean, free from dirt, oil and grease. Store in a suitable case to protect from contamination.

4.3.6.3 Electrode Diameter

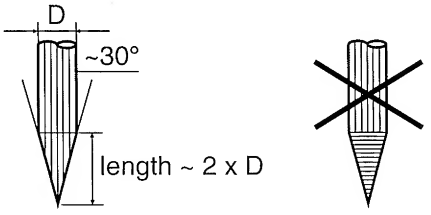
The electrode diameter should match the welding current. General values are:

less than 80 A : diameter 1.0 mm
70 A to 140 A : diameter 1.6 mm
130 A to 250 A : diameter 2.5 mm
with AC > 220 A : diameter 3.2 mm

4.3.6.4 Electrode Tip Ground

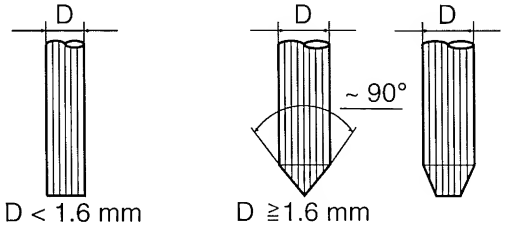
Electrodes for DC welding have to be ground in longitudinal direction only. Do not grind electrodes <=1.6 mm diameter for AC welding at all, over 1.6 mm diameter with an acute-angled tip with a dull point. When welding with alternating current the electrode will automatically form a tear shape drop at the tip.

DC welding
(negative electrode polarity)



The electrode is normally ground (straight polarity)in longitudinal direction. For special applications grinding marks have to be removed by polishing.

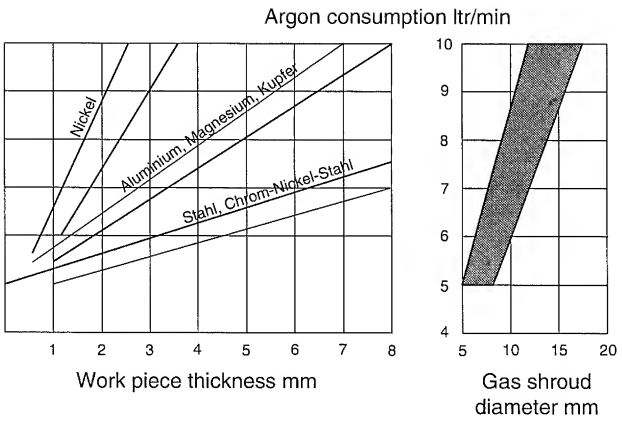
AC welding
(negative electrode polarity)



With larger diameter the electrode tip is ground. When welding, an tear shape drop forms automatically at the tip.

4.3.6.4 Shielding Gas

Too much gas flow can reduced the arc starting ability. The correct gas flow rate is depending on the base metal and the work piece thickness.



4.4 MANUAL ARC Welding

4.4.1 General Information For Welding Transformer/Rectifier Operators

Dust, dirt and metal chips will harm any welding machine. It is of particular importance that the air ventilation for cooling is not disabled.
A weld should join two work pieces as if they were made from a single piece. Prior to the welding the joints must be cleaned and dirt, rust, grease and paint removed. Also slag from previous welds must be completely removed. Attach earth clamp firmly to work piece, assuring good metal to metal contact. Check that all cables and connectors are in proper operating condition to ensure proper current conduction.
With the MWS Control the polarity can be changed from + to - or vice versa, without having to change the welding cables in the machine sockets, to accommodate both straight or reversed polarity electrodes.
Normally protective glasses of shade DIN 9 are used for electrodes from 1.5 mm to 4 mm Ø, for electrodes over 4 mm Ø shade DIN 10.
Select the correct welding current as shown below:

Current (A)	Electrode Ø	Material Thickness
25 - 50	1.0 - 2.0 mm	1.0 - 2.0 mm
50 - 100	2.0 - 2.5 mm	2.0 - 4.0 mm
100 - 140	2.5 - 3.25 mm	4.0 - 8.0 mm
140 - 220	3.25 - 5.0 mm	8.0 - 12.0 mm
220 - 300	5.0 - 6.0 mm	12.0 - 20.0 mm

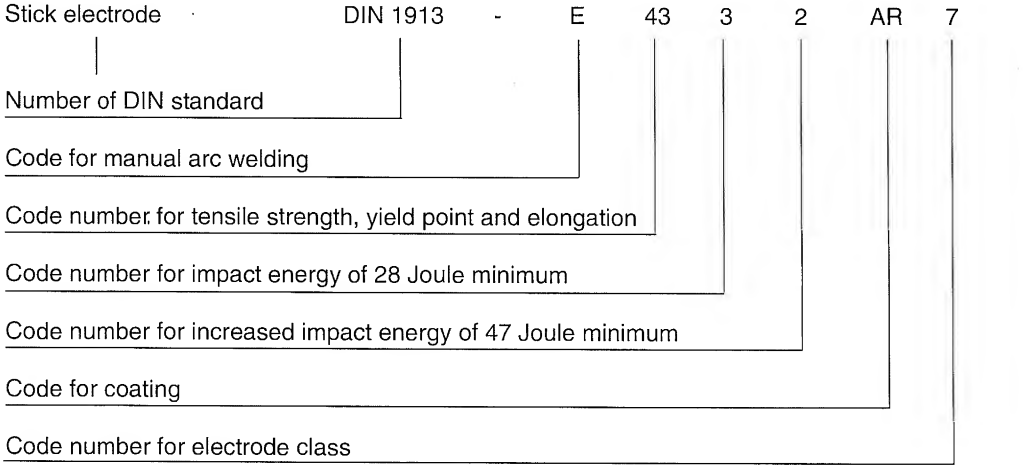
In principle do not use too thick an electrode. As a general rule calculate 40 amps welding current per 1 mm of electrode diameter. Depending on electrode type, material thickness and weld position this calculated value may have to be adjusted to plus or minus.
In manual arc welding mode the OMEGA 400 works perfectly with thin plate from 1.0 mm thickness and is suitable for vertical-down welding.

4.4.2.1 Overview Of Stick Electrodes And Their Correct Use

In order to achieve a good weld the electrode has to be dry, thus storing in a dry place is essential. Should electrodes have become moist, dry in an oven at 200° C to 300° C for 1 - 2 hours.
Basic coated low-hydrogen type electrodes always require pre-drying at 200° C to 300° C for 3 hours as atomic hydrogen causes weld flaws.
Stick electrodes are coded according to DIN 1913 and other standards, such as AWS-SFA, BS and ISO. These codes are always shown on the electrode package.

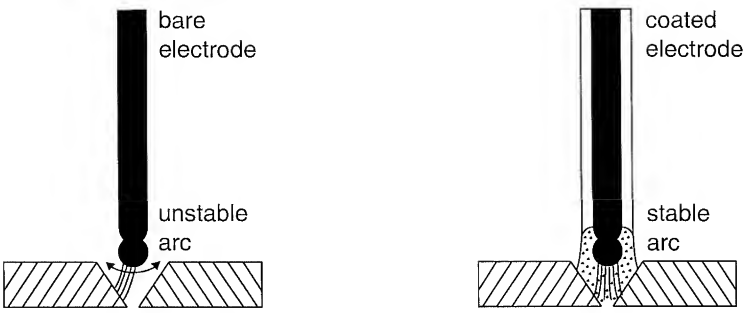
4.4.2.2 Coding Of Stick Electrodes According To DIN 1913

Example:

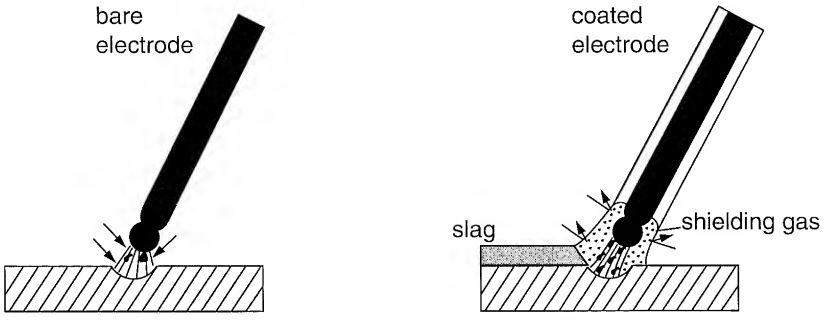


4.4.2.3 Function Of The Stick Electrode Coating

Stabilization of the arc and ionization of the arc space



Protection of the weld metal from atmospheric oxygen and nitroge

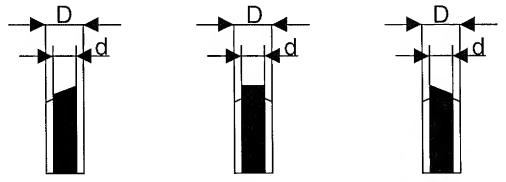


This protection is achieved by the generation of shielding gases and slag during the melting of the electrode.

Compensation of alloy burn-off

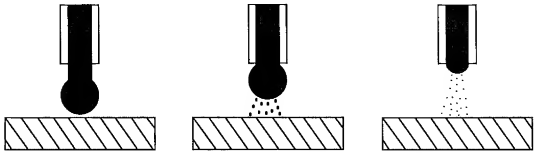
Stick Electrodes According To DIN 1913

Coating thickness

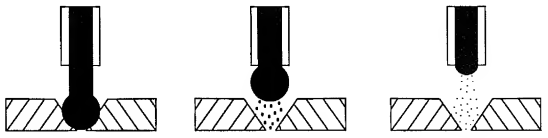


light	medium	heavy
$D = 1{,}2 \cdot d$	$D > 1{,}2 \cdot d$ but $\leqq 1{,}55 \cdot d$	$D > 1{,}55 \cdot d$

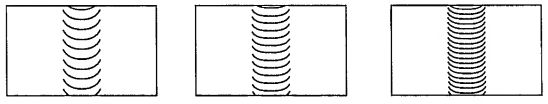
Material transfer



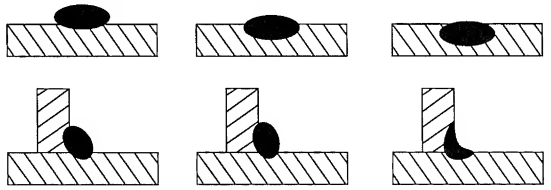
Gap bridging ability



Weld seam appearance



Penetration depth



Type of Coating

A	acid coated	R(C)	rutile cellulose medium coating
R	rutile light and medium coating	RR(C)	rutile cellulose heavy coating
RR	rutile heavy coating	B	basic coating
AR	rutile acid coating	B(R)	basic coating with non-basic proportions
C	cellulose coating	RR(B)	rutile basic heavy coating

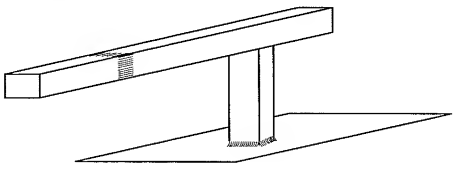
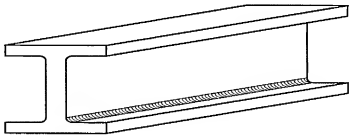
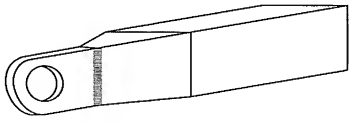
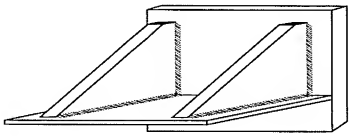
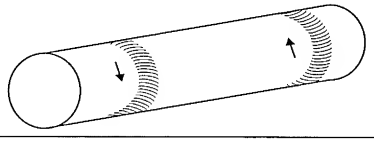
4.4.2.4 Classification of Stick Electrodes
according to table 3 of DIN 1913

Class	Stick Electrode Type	Coating Thickness	Weld Position
2	A 2	light	1
	R 2		
3	R 3	medium	2 (1)
	R(C) 3		1
4	C 4		
5	RR 5	heavy	2
	RR(C) 5		1
6	RR 6		2
	RR(C) 6		1
7	A7		2
	AR 7		
	RR(B) 7		
8	RR 8		
	RR(B) 8		
9	B 9		1
	B(R) 9		
10	B 10		2
	R(R) 10		
11	RR 11	(high performance electrodes)	4 (3)
	AR 11		
12	B 12		
	B(R) 12		

Code for Welding Position
according to table 4 of DIN 1913

Code	Weld Position	Code Letter For Welding Position
1	all	w, h, hü, s, f, q, ü
2	all except vertical-down	w, h, hü, s, q, ü
3	gravity position fillet weld gravity position horizontal	w w h
4	gravity position	w

4.4.2.5 Selecting Suitable Electrodes For A Welding Task

Component	Welding Task	Stick Electrode Type
	out-of position welding of butt and fillet welds on thinwalled ex-trusions	RR 6 RR 8
	horizontal or gravity position fillet welds on long beams with "a" = 5 mm	RR 11 AR 11
	gravity position double-V welds on thick plate tow bars	B 10
	out-of-position fillet welds on bracket of 10 mm thick plate	RR(B) 7 RR(B) 8
	out-of-position butt welds on pipelines	weld 1: C 4

Stick electrodes can be classified according to their coating as under:

Type Code Type Coating Characteristics	Type of Slag - Slag Removal Ability	Penetration Depth - Gap Bridging Ability	Electrode Manipulation	Characteristics	Weld Appearance
O **Bare Electrode** finely distributed arc stabilizers in the electrode material	minimal slag	shallow - excellent	more difficult to weld than any other stick electrode	very high deposition rate, minimal heat stress, little heat distortion	convex, coarsely rippled
OO **Flux-Core Electrode** arc stabilizers rolled into the electrode's core	minimal slag	average to deep - excellent	slightly easier to weld than bare electrodes	good deposition rate, minimal heat stress, little weld distorition, especially for root welds	convex - coarsely rippled
N **Titania Oxide Type** high contens of titanium oxide	porous, even slag blanket - easily removed	average - good to excellent, depending on coating thickness	weldability of fillet welds improves with increasing coating thickness	general purpose electrodes, for steels sensitive to welding conditions, for thin plate	slightly convex to flat, finely to medium-coarsely rippled
Es **Acid-Coated Type** high contents of heavy metal oxides	porous, even slag blanket	deep - average	weldability of fillet welds improves with increasing coating thickness	for steels sensitive to welding conditions, requires good weld preparation	flat, finely rippled
Ox **Iron Oxide Type** high contents of iron oxides	tight slag blanket of evenly distributed thickness - very easily	shallow - very poor	good weldability, fillet welds in gravity position only	for unalloyed low-carbon steels, requires good weld preparation	concave, very finely rippled
Kb **Basic Low-Hydrogen Type** high contents of calcium or other alkaline carbonates	thick slag blanket - fair	medium - good	handling requires some practice, in particular when setting electrode to and removing from weld	particularly suitable for thick plate and rigid assemblies, for high-carbon steels, for thermo steels	slightly convex, medium-coarsely rippled
Ze **Cellulose Type** high contents of organic components	minimal, often quickly solidifying thin slag blanket - easy	deep - very good	good handling as only minimal slag, heavy fume generation	for out-of-position welding	slightly convex, rippled

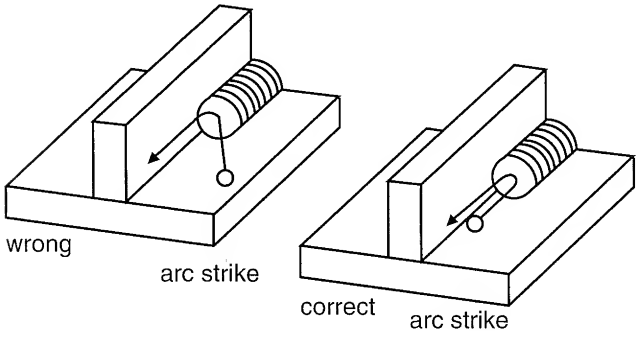
In addition to the electrodes types shown in the above table there are several special types available coded SO. Cast iron electrodes, for example, fall into this class.
When buying Kb and So type electrodes make sure they are suitable for AC current. As far as the quality grades are concerned, a higher number indicates a better grade quality. For common low-carbon steels grades 7 - 9 are best suitable.
The last letter of the code shown on the stick electrode indicates the coating thickness.

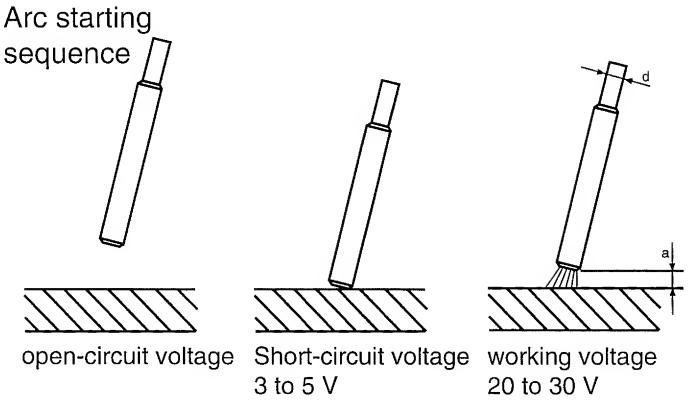
d = light coating
m = medium coating
s = heavy coating

4.4.2.6 Arc Starting And Arc Burning

Arc Strike

Always start the arc in the welding groove.
When the arc is stable weld over the arc strike and melt for good fusion, otherwise there is a risk of cracking.





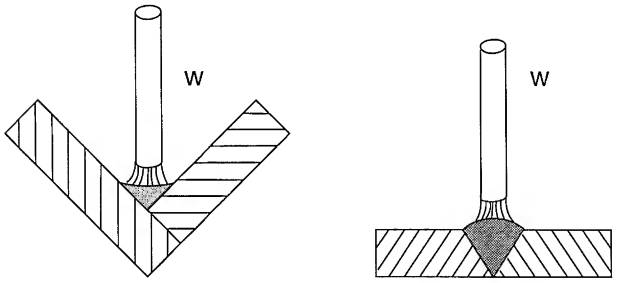
Arc Length

The arc length "a", that is the distance between the stick electrode and the work, should be:

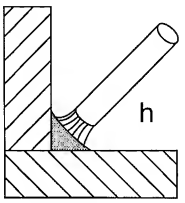
with stick electrodes of coating type R, RR, A, C = 1.0 x d
with stick electrodes of coating type B = 0.5 x d

Too long an arc reduces the penetration, increases the arc blow effect and, particularly with basic coated stick electrodes, causes a porous weld seam.

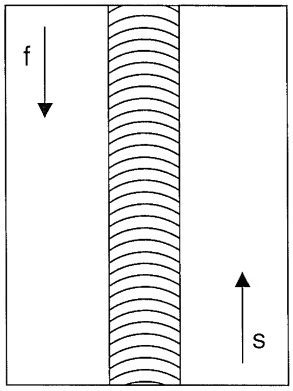
4.4.2.7 Welding Positions According To DIN 1921



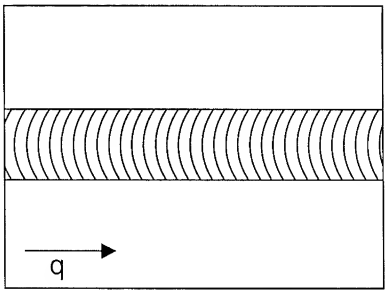
w = gravity position



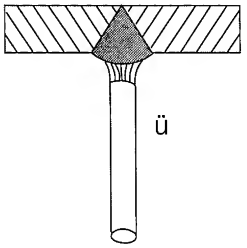
h = horizontal position



s = vertical-up position
f = vertical-down position



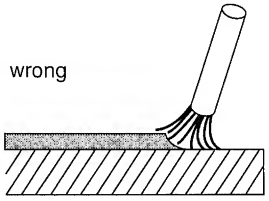
q = horizontal-vertical position



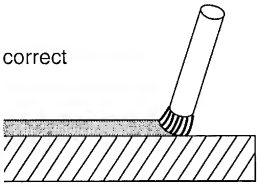
ü = overhead position

4.4.3 Welding Hints

Because of the multitude of and great differences in the important points for welding only the very basic operations for the most common electrodes for low-carbon steels, the Ti-type electrode, are introduced here. In the case that other electrodes have to be used, the electrode manufacturers supply upon request all relevant information for the type of special electrode to be used.
Always make some trial welds on scrap material. Select electrode diameter and welding current as per Table 1). Attach earth clamp to work piece and place electrode into electrode holder as described earlier. Now hold the electrode tip approx. 2 cm / 3/4 inch above the starting point of your welding seam. Hold the welding visor in front of your face and draw the electrode with a short stroke along the groove. Through the welding shield you watch the arc, keeping it to a length of 1 to 1.5 times the electrode diameter.

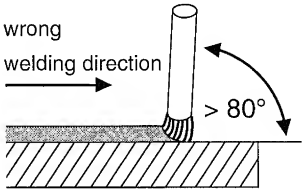


arc too long
(Fig. 1)

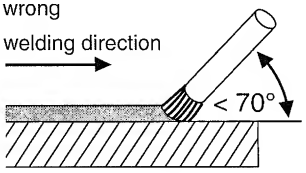


approx. 1 - 1.5 the electrode-Ø
(Fig. 2)

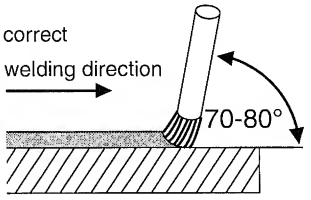
The correct arc length is important for a good weld, because with too short or too long an arc both welding current and working voltage change. A low working voltage causes insufficient penetration. Too high or too low welding current gives a poor welding seam. Too long an arc does not sufficiently melt the parent material, resulting in high spatter losses. Also the air, with its detrimental substances like hydrogen and nitrogen, may get access to the weld pool.
For a good weld the work angle of the electrode (or electrode inclination angle) is of substantial importance. The inclination should be 70° - 80° to the welding direction. With the work angle too steep slag will run under the weld pool, too flat an work angle causes the arc to spatter, in both cases the result is a porous, weak welding seam (see figure 3 - 5).



(Fig. 3)

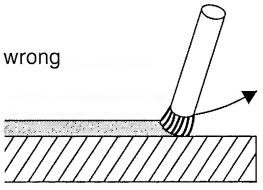


(Fig. 4)

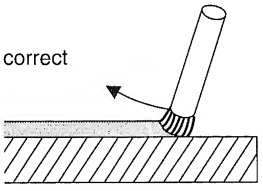


(Fig. 5)

The welder has to keep the arc at the same length, that is the electrode burn-off is compensated by feeding the electrode into the weld. At the same time the welder has to watch the weld pool for even penetration and width.
Welding is always done from left to right (backhand welding).
At the end of the welding seam the electrode can not simply be lifted or pulled from the weld, this creates porous end craters, which weaken the weld. To correctly terminate a weld the electrode is held for a short moment at the end of the weld seam, then lifted in an arc over the just laid weld.



(Fig. 6)

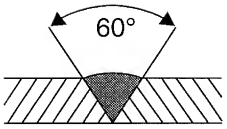


(Fig. 7)

Remove slag only after it has cooled down and is no longer glowing.
If an interrupted weld is to be continued, the slag at the end of the already finished weld must be removed. Then the arc can be started either in the groove or on the weld, as described earlier, and then moved to the end of the weld, which has to be thoroughly melted for good fusion. Welding is then continued normally.

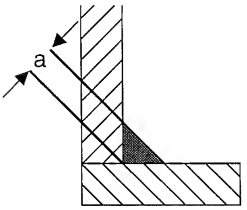
4.4.4 Weld Types

For **Butt Welds** the work piece edges should be bevelled to approx. 30°, which gives a groove angle of 60° (Fig. 8). The root opening between the two work pieces should be 2-3 mm.



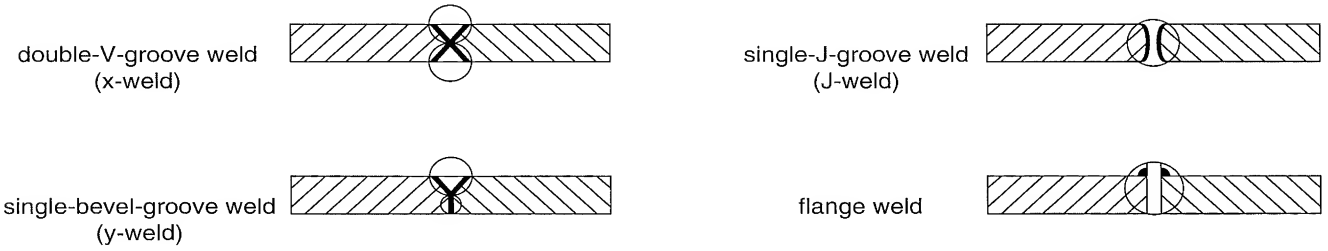
(Fig. 8)

For **Fillet Welds** "a" is the throat width size. The throat width should be at least x 0.7 the plate thickness of the thinner plate.

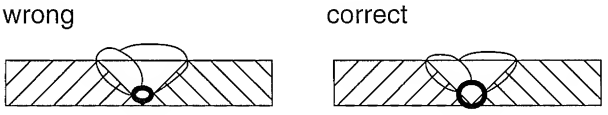


(Fig. 9)

Other weld types:



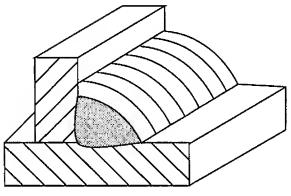
A joint weld must always have a good fusion at the root.



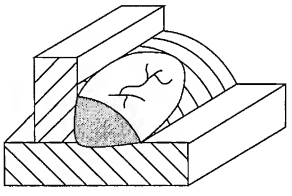
(Fig. 10) (Fig. 11)

Let weld cool down in the ambient air, do not quench.

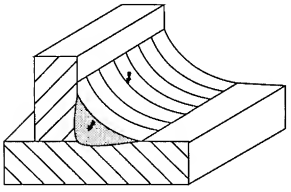
4.4.5 Weld Flaws And Possible Causes - Shown On Fillet Welds



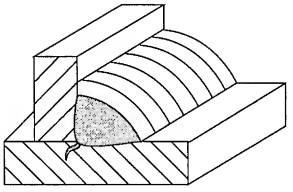
Weld Undercut
Welding current to high
Electrode work angle too steep
Arc too long



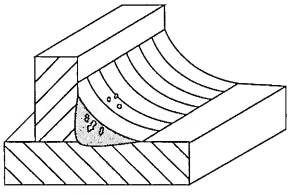
End Crater
Electrode removed too quickly from the weld pool, particularly with high welding currents risk of shrinkage cracking



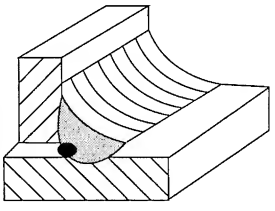
Slag Inclusion
Welding current too low
Welding speed to high
Welding over slag on multi-layer welds



Weld Toe Cracks
Material sensitive to welding conditions
Weld cooled down too fast after welding



Gas Inclusion
Work surface not clean
(rust, grease, paint)
Arc to long
Basic coated electrodes not sufficiently dried

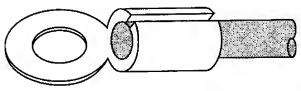


Root Flaw
Slag entering root area because distance too great

4.4.6 Accessories And Accessory Maintenance

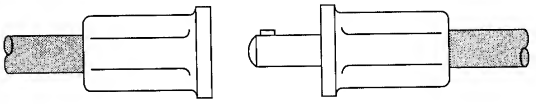
Connecting Welding Cables To The Welding Power Source

Cable plug

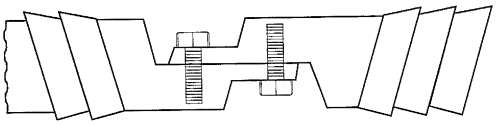


Ring tongue terminal soldered, crimped, clamped

Connecting (Extending) Welding Cables

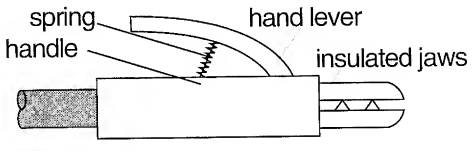


Cable socket Cable plug



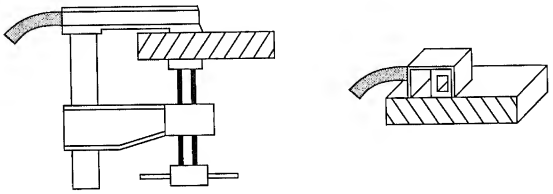
Insulate screw joint terminal with rubber bush or heat-shrinkable sleeve

Fully Insulated Electrode Holder



Replace broken insulating parts at once!

Connection Of Welding Cables To The Work Piece



Clean work piece surface for good conduction

Attach earth clamp as close as possible to the weld. Structural components, beams, pipes or rails should not be used for earth conducting, if they are not the actual work piece.

5.0 Safety Precautions/Accident Prevention

Always disconnect from power before servicing. Electrical repairs should only be carried out by a qualified electrician. At time of delivery the welding power source meets the requirements of EN 60974-1 and other applicable standards.
The open-circuit voltage is below the legal limit for welding in confined spaces having electrically conductive sides, or areas with increased electrical hazard in general, e.g. boilers. To protect the welder against increased electrical hazard insulating mats are compulsory.
The Welding Power Source itself may not be placed or operated in areas with increased electrical hazard. After actuating the trigger switch the electrode wire spool is under current.
Please refer to all local laws and regulations for the prevention of accidents and fires.
Wear only dry clothes, a leather apron and welder's gloves. Use welding visors or helmets with shaded lenses according to DIN 4647 or equivalent.
After work is finished always switch machine OFF and close the cylinder valve. Handle gas cylinders with care: do not throw or heat, keep from tipping over. Always remove cylinder from machine when it is hoisted by crane.
Workpieces, which have been degreased with chlorinated solvents, should be rinsed thoroughly with water afterwards. Otherwise there is danger of phosgene gas developing. For the same reason no degreasing baths should be located in the vicinity of the work area.
Caution: all metallic fumes are hazardous! This warning applies to lead, copper, cadmium, zinc and beryllium in particular. Keep work area well ventilated; use respiratory gear if necessary.

5.1 Overloads/Low Voltage

5.1.1 Overloads

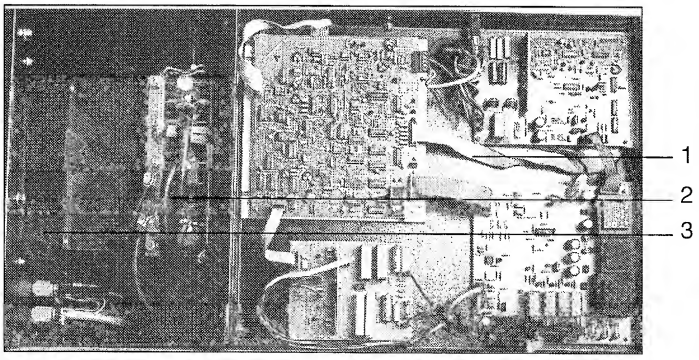
The OMEGA 400 is positively protected against overloads by several independent protection devices. If the permissible duty cycle is exceeded, the machine is shut down automatically and a message displayed in the MWS display. After a short cooldown period the machine is operational again.
Important: Do not switch the power off, this will cut the power supply to the fan, extending the cooldown time considerably.

5.2 Safety Instructions

- This Welding Machine should only be used for its intended application (MIG/MAG, TIG and Manual Arc Welding).
- Know and adhere to all applicable local safety standards and codes.
- Always wear appropriate apparel when welding.
- Never work without welding visor and gloves, as with TIG welding the arc emits very intense ultra-violet radiation.
- Operate machine only in dry places.
- Operate machine only on power supply circuits having a fully operational protective bonding circuit (earth/ground lead).
- Do not operate near electronic data processing equipment or numerically controlled machinery in operation. The H.F. ignition may interfere with the electronics. Switch such equipment off before starting to weld.

6.0 Service and Maintenance

All Elektra Beckum Welding Machines require only minimal maintenance. All electronic components (see Pic. 27), including the front-panel PCB, are protected against dust build-up and are electrically separated (short-circuit proof). Depending on dust built-up, but at least every 4-6 months, the machine should be cleaned with dry and oil-free compressed air and all components given a visual check.



1. Electronic controls - dust protected
2. Rectifier
3. Cooling fan

Pic. 27 Location of principal components

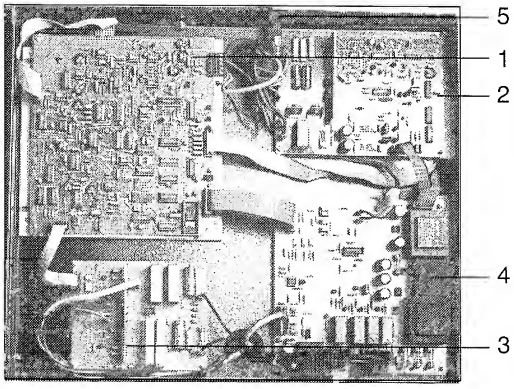
All components are easily accessible for servicing and maintenance.

The contact tip and gas shroud are the parts most exposed to the radiant heat of the arc. They need to be cleaned regularly of spatters and treated with anti-clogging spray and/or nozzle dip.
Excessive built-up of spatters can short-circuit contact tip and gas shroud, ruining both., Spatter built-up inside the gas shroud may also prevent effective seam shielding.
The machine should be checked at regular intervals for visible defects.
A thorough check of the electrical components should be carried out every 6 months. Disconnect machine completely from power supply (pull plug; switching off circuit breakers or removing fuses is no adequate separation).
Re-tighten all screw and clamping terminals. Have a qualified electrician check-out and repair any scorched leads or cables.
Check coolant level.

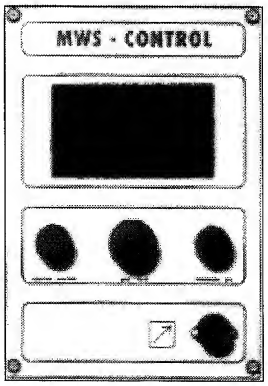
When ordering spare parts state machine model, production no. and stock number of the required part(s).

6.1 Electronic Controls

The front panel electronic controls can be removed from the machine for servicing by simply removing the four fastening screws holding it in the panel.



Pic. 28 Electronic controls



Pic. 29 Front panel PCB (MWS Control)

The PCB with the electronic controls is located directly under the machine housing's top panel. Unscrew the four lifting eyes and remove the top panel to access the PCB.
The electronic components are electrically separated.

1. Inverter control module
2. Motor module (identical to those of SEC models) is protected against damage and works load independent. A blocked wire feed or a short-circuit in the motor control leads are recognized and only cause the MWS Control to shut the machine down and display an error message.
3. H.F. module
4. Power mains module
5. ETA circuit breaker for water cooling unit (2 A)

7.0 Error Messages

In the event of a fault being detected in the system, the MWS Control displays one of the following messages:

Display:

- Watercooling fault
  Switch off for 5 sec
  (low coolant, coolant pump, fault in torch leads)

- Excess temperatur
  Please wait

- Low voltage
  switch off for 5 sec
  (voltage drop > 20 % - below 340 V)

- High voltage
  switch off for 5 sec
  (voltage surge > 20 % - over 440 V)

- Error remote control
  Switch off for 5 sec
  (communication error with external wire feed unit or between interface and welding robot)

- Error wire feed
  Switch off for 5 sec
  (w ire feed motor blocked or short circuit-external or internal)

8.0 Trouble Shooting

Fault	Cause	Remedy
Irregular wire feed	Incorrect tension of tension roller Pilot groove of feed roller and intake nozzle not aligned Liner clogged or not correct size for wire Wire spooled irregularly, rusty or of inferior quality Wire spool carrier brake to tight Feed rollers dirty of worn, groove not matching wire size	Adjust tension Align Check and/or change Change spool, clean or change liner Loosen Clean or replace
Brittle or porous welding seam	Gas line fittings not tight Gas cylinder empty Gas cylinder valve closed Pressure regulator not working Solenoid valve not working Gas shroud or line in lead ass'y clogged Air draft at weld seam Workpiece not clean Wire of inferior quality or unsuitable gas	Check fittings Replace cylinder Open valve Check Check power at solenoid Clean shroud and spray, blow out gas line Protect from draft or increase gas flow Remove rust, grease, paint Change wire, use suitable gas
Constant gas flow	Solenoid valve defective or dirty	Check, clean or replace
No wire feed	Trigger switch or leads in lead ass'y defective PCB defective	Check, replace if necessary Replace
No welding current with normal working wire feed	Earth cable not conducting	Correct
Arcing when gas shroud touches workpiece	Short-circuit between contact tip and gas shroud	Clean shroud, treat with anti-clogging spray or nozzle dip
Torch becomes excessively hot	Contact tip loose or too large for wire diameter Low coolant level Defective coolant pump	Tighten tip, replace with correct size tip Top off coolant Repair or replace
No function of machine: Water-cooled units	Mains fuse/circuit breaker tripped Coolant pump overload protection tripped	Reset or replace Reset overload switch

9.0 Spare Parts

Pos.	Description	Stock-No.	SEK/WX	SEK/W
10	Base plate, welded	100 240 6590	●	●
20	Swivel caster Ø 200/50	727 108 0284	●	●
30	Caster Ø 200/50	727 108 0292	●	●
60	Housing rear panel	100 240 6671	●	●
70	Louver panel	132 140 8415	●	●
80	Solenoid valve NW 2.5 R 1/8" 220 V	805 200 8264	●	●
100	Front panel, welded	100 241 1462	●	●
110	Panel socket 50 mm²	821 507 1317	●	●
120	Terminal carrier	132 240 6777	●	●
130	Pilot transformer bracket	100 240 6817	●	●
140	Pilot transformer 7PRI 230 V - 2 x 28 V - 25 VA	805 613 9290	●	●
150	Pilot transformer plate	132 240 7242	●	●
160	Pilot transformer rectifier	805 314 1375	●	●
170	Spoiler plate, welded	132 241 1444	●	●
180	Intermediate base plate	132 241 1100	●	●
190	Transformer insulation bracket small	137 108 5153	●	●
210	Fan carrier	132 140 2093	●	●
220	Rotary fan	804 113 1692	●	●
230	Capacitor 2 µF/400 V	805 013 8039	●	●
240	PCB base panel	132 241 1428	●	●
250	Wire protecting sleeve	824 103 3466	●	●
260	Wire feed housing	132 240 6114	●	●
270	Spool carrier ass'y	132 107 3880		●
271	Inner arbor - spool carrier	132 711 2950		●
272	Outer arbor - spool carrier	132 711 2968		●
273	Cap - spool carrier	132 711 2976		●
274	Spring dish - spool carrier	132 711 2984		●
275	Pressure spring - spool carrier	132 711 2992		●
278	Cap screw M10x70	612 104 7932		●
280	Panel socket, 4-pole	821 514 1358	●	●
290	Euro connector	132 713 3868	●	●
300	Handle	132 111 5663	●	●
310	Handle	132 813 9894	●	●
320	Gas cylinder rack, welded	100 240 6396	●	●
330	Cylinder carrier	132 240 4448	●	●

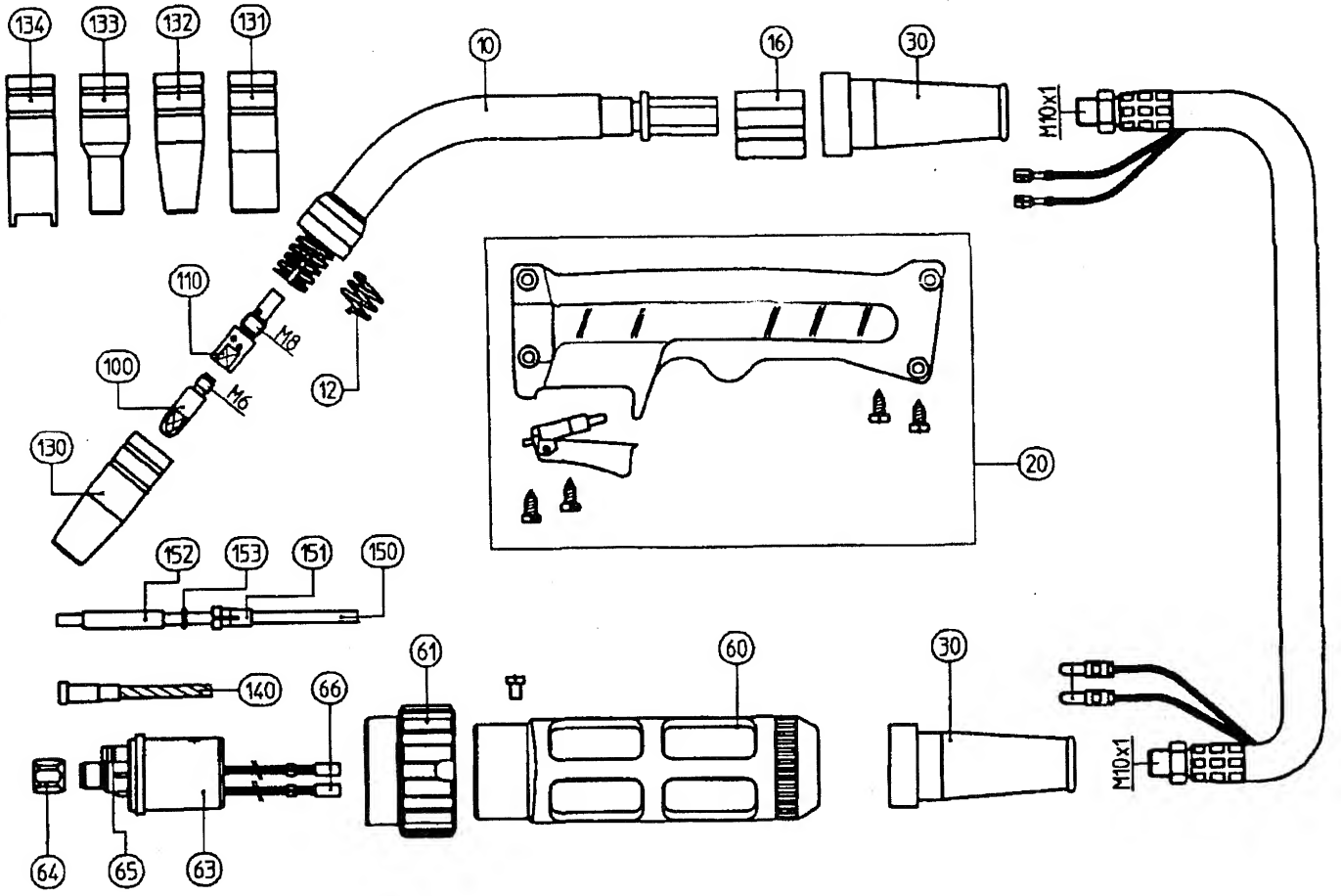
Pos.	Description	Stock-No.	SEK/WX	SEK/W
340	Knotted link chain, galvanized	723 607 0870	●	●
350	Side panel, large	132 240 6696	●	●
360	Side panel, small	132 240 6688	●	●
370	Door - wire feed compartment	132 240 6700	●	●
380	Screw hinge	701 513 9832	●	●
390	Lock with ring handle	701 414 0063	●	●
400	Tongue, narrow	701 414 0071	●	●
410	Thermal overload switch	810 009 3260	●	●
420	Housing top panel ass'y	100 213 9738	●	●
430	Lifting eye M12x20.5 galvanized	615 112 9682	●	●
440	Plug Ø 33.4x15.0	132 114 1362	●	●
500	Spoiler - Transformer 400	132 240 7277	●	●
510	Main transformer 400	100 215 9747	●	●
520	Choke 400	100 216 1032	●	●
530	Current control unit 400	810 616 1063	●	●
540	Rectifier bank 400	805 300 4386	●	●
545	Discharge resistor 560 Ohm	805 116 9736	●	●
550	MWS Control unit 400 SEK	100 215 9801	●	●
560	AC logic module	810 616 1110	●	●
570	Power mains module SEK	810 616 1098	●	●
580	Motor module SEK	810 613 9513	●	●
590	HF-AC module SEK	810 616 1101	●	●
600	Power cable ass'y 32 A CEE 4 x2.5x6000	840 213 8590		●
610	Switch, mains on/off 32 A	811 213 9215		●
620	Type plate 400 SEK/W Type plate 400 SEK/WX	110 615 9595 110 615 9609	●	●
1000	Wire feed ass'y, heavy-duty	100 214 9610		●
1010	Wire feed motor	801 109 2064		●
1020	Parallel pin 8x60	650 500 2324		●
1030	Drive cog with hub, steel	132 500 0259		●
1040	Grub screw M6x10	616 300 1029		●
1050	Drive cog w/o hub, plastic	132 100 0378		●
1060	Feed roller, hardened	132 500 0232		●
1070	Clamping sleeve 3x16	650 300 1657		●
1080	Needle bush Fw. 8x10	710 400 2352		●
1090	Spacer wheel	132 100 4837		●
1100	Shaft bracket	142 206 5993		●

Pos.	Description	Stock-No.	SEK/WX	SEK/W
1110	Spacer bush DH 6x9	644 205 9304		●
1120	Electrode wire guide	142 204 8924		●
1130	Starknob screw M6x20	700 112 4212		●
1140	Gear bracket	132 001 6670		●
1150	Fitting screw SW 13	142 540 8891		●
1160	Spacer washer	132 100 4845		●
1170	Torsion lock	100 201 3424		●
1180	Drive cog w/o hub, steel	132 500 9752		●
1190	Pressure roller, hardened	132 500 0240		●
1195	Needle bush 8x10	710 400 2352		●
1200	Clamping sleeve 3x16	650 300 1657		●
1205	Set screw M8x30	616 800 9192		●
1210	Eye bolt M8x60	614 100 9328		●
1220	Press. spring Ø 2.5x12.5x25	705 108 6532		●
1230	Starknob M8 galvanized	700 001 7730		●
1240	O-ring 7.00x1.50	763 200 9520		●
1250	Clamping sleeve 6x12	650 308 8175		●
1260	Insulating plate, drilled 1.0 - 1.2 (0.140 lg)	132 707 1129		●
1270	Insulating plate, drilled 4x100x180	132 140 6501		●
1280	Insulating plate, drilled 2x180x300	132 140 6498		●
1290	Insulating plate 1,5x45x127	132 141 2641	●	●
2000	Coolant tank	132 140 6803	●	●
2010	Threaded cap Ø 62	132 114 6399	●	●
2020	Hose stem R3/8"x9 female	780 500 9475	●	●
2025	Hose stem R 1/4"/x9 male reducing to Ø 2.5	132 540 9173	●	●
2030	Hose stem R 3/8"x9 male	780 500 9483	●	●
2040	Reducer R 3/8"x1/2"	780 900 9291	●	●
2045	Hose clamp 12 - 20	781 101 7820	●	●
2050	Centrifugal pump c/w motor	134 413 6927	●	●
2060	Screwed joint	787 214 0543	●	●
2070	Faucet union G 1/4"xM12x1	132 540 7855	●	●
2080	Union tee R 1/4"	787 211 0407	●	●
2090	Reducer R 1/8"x1/4"	780 900 9275	●	●
2100	Diaphragm pressure switch	810 113 9817	●	●

Pos.	Description	Stock-No.	SEK/WX	SEK/W
2110	Elbow hose stem R 1/4"x10 male	780 511 7618	●	●
2120	Reducer R 1/4"x3/8"	780 900 9283	●	●
2130	Radiator	132 740 5680	●	●
2140	Motor protection ETA 1.5 A	810 000 4900	●	●
2150	Contactor	810 404 2873	●	●
2160	Resistor 10 Ohm 40 W	805 116 1077	●	●
2170	Resistor carrier	132 241 1495	●	●
2180	Cap, threaded	824 314 3897	●	●
2190	Bush	821 511 5624	●	●
2200	Cap, 3/4"	824 314 1436	●	●
2210	Contact carrier 6 S	821 611 5717	●	●
2220	Contact carrier 4 S	821 611 5709	●	●
2230	Quick coupling	771 015 1002	●	●
2240	Shunt-resistor 0.1 m Ohm	805 116 1085	●	●

MIG/MAG Welding Torch

SB 25/2

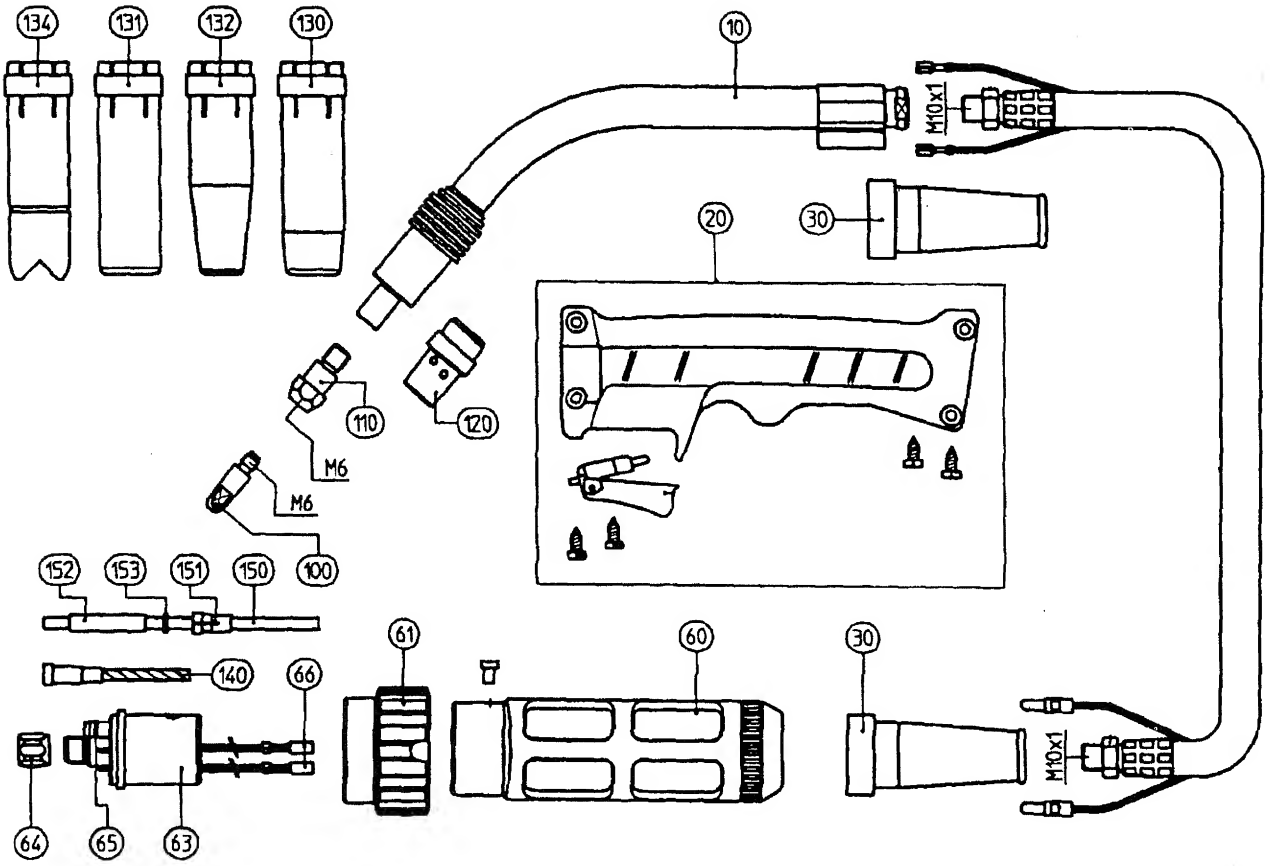


Pos.	Description	Stock-No.
	Welding Torch SB 25/2	
	with torch leads 3 mtr	090 200 8330
	with torch leads 4 mtr	090 200 8349
	with torch leads 5 mtr	090 200 8357
10	Swan neck, complete	090 200 5650
12	Gas shroud spring	132 704 5454
16	Torch body, plastic	132 707 4527
20	Handle ass'y, red SB 25-SB 501	132 706 4319
30	Lead support	132 704 5209
60	Lead support	132 706 4068
61	Adaptor nut	132 706 4076
63	Central adaptor block KZ2	132 707 5515
64	Collte nut M 10x1	132 706 4106
65	O-ring 4x1	132 706 4092
66	Trigger lead connector	132 706 4084
100	Contact tip M6 - 0.8 mm	132 704 5462
100	Contact tip M6 - 1.0 mm	132 704 5489
100	Contact tip M6 - 1.2 mm	132 704 5497
100	Contact tip M6 - 0.8 mm Aluminium	132 700 9695

Pos.	Description	Stock-No.
100	Contact tip M6 - 1.0 mm Aluminium	132 700 9709
100	Contact tip M6 - 1.2 mm Aluminium	132 700 9717
110	Contact tip holder	132 707 5574
130	Gas shroud, conical	132 704 5519
131	Gas shroud, cylindrical	132 704 5500
132	Gas shroud, conical small	132 704 5527
133	Gas shroud, bottle neck	132 704 5535
134	Spot weld shroud	132 704 5543
140	Insulated liner, blue, 0.6-0.9 3 mtr	132 706 4203
140	Insulated liner, blue, 0.6-0.9 4 mtr	132 706 4211
140	Insulated liner, blue, 0.6-0.9 5 mtr	132 706 4220
140	Insulated liner, red, 1.0-1.2 3 mtr	132 706 4238
140	Insulated liner, red, 1.0-1.2 4 mtr	132 706 4246
140	Insulated liner, red, 1.0-1.2 5 mtr	132 706 4254
150	Polyamid liner, 0.8 - 1.2 3 mtr	132 714 4550
150	Polyamid liner, 0.8 - 1.2 4 mtr	132 714 4541
150	Polyamid liner, 0.8 - 1.2 5 mtr	132 714 4533
152	Guide tube polyamid liner 4.0 OD	132 704 5578
153	O-ring 3.5x1.5 for guide tube	132 707 5531
	Contact tip wrench (not shown)	132 704 5411

MIG/MAG Welding Torch

SB 36/2

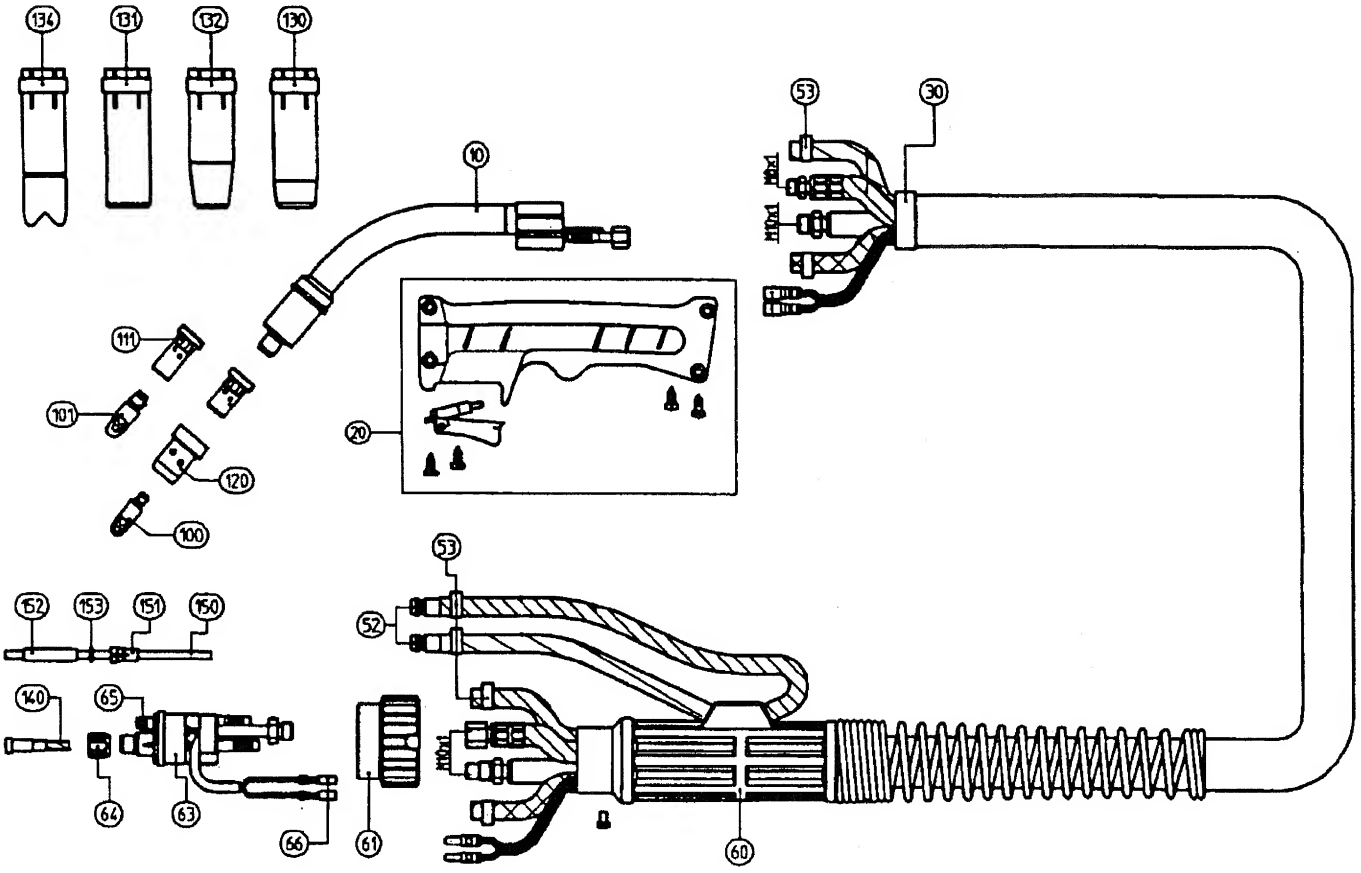


Pos.	Description	Stock-No.
	Welding Torch SB 36/2	
	with torch leads 3 mtr	090 200 8411
	with torch leads 4 mtr	090 200 8420
	with torch leads 5 mtr	090 200 8438
10	Swan neck, complete	090 200 5668
20	Handle ass'y, red SB 25-SB 501	132 706 4319
30	Lead support	132 706 4041
60	Lead support ass'y	132 706 4068
61	Adaptor nut	132 706 4076
63	Central adaptor block KZ2	132 707 5515
64	Liner collet M 10x1	132 706 4106
65	O-ring	132 706 4092
66	Trigger lead connector	132 706 4084
100	Contact tip M6 - 0.8 mm	132 704 5462
100	Contact tip M6 - 1.0 mm	132 704 5489
100	Contact tip M6 - 1.2 mm	132 704 5497
100	Contact tip M6 - 0.8 mm Aluminium	132 700 9695
100	Contact tip M6 - 1.0 mm Aluminium	132 700 9709
100	Contact tip M6 - 1.2 mm Aluminium	132 700 9717

Pos.	Description	Stock-No.
110	Contact tip holder	132 706 4149
120	Standard gas diffuser	132 706 3991
130	Gas shroud, conical	132 706 4165
131	Gas shroud, sylindrical	132 706 4157
132	Gas shroud, conical small	132 706 4173
134	Sport weld shroud	132 706 4190
140	Insulated liner, blue, 0.6-0.9 3 mtr	132 706 4203
140	Insulated liner, blue, 0.6-0.9 4 mtr	132 706 4211
140	Insulated liner, blue, 0.6-0.9 5 mtr	132 706 4220
140	Insulated liner, red, 1.0-1.2 3 mtr	132 706 4238
140	Insulated liner, red, 1.0-1.2 4 mtr	132 706 4246
140	Insulated liner, red, 1.0-1.2 5 mtr	132 706 4254
150	Polyamid liner, 0.8-1.2 3 mtr	132 714 4550
150	Polyamid liner, 0.8-1.2 4 mtr	132 714 4541
150	Polyamid liner, 0.8-1.2 5 mtr	132 714 4533
152	Guide tube polyamid liner 4.0 OD	132 704 5578
153	O-ring 3.5x1 for guide tube	132 707 5531
	Contact tip wrench (not shown)	132 704 5411

MIG/MAG Welding Torch

SB 401 W

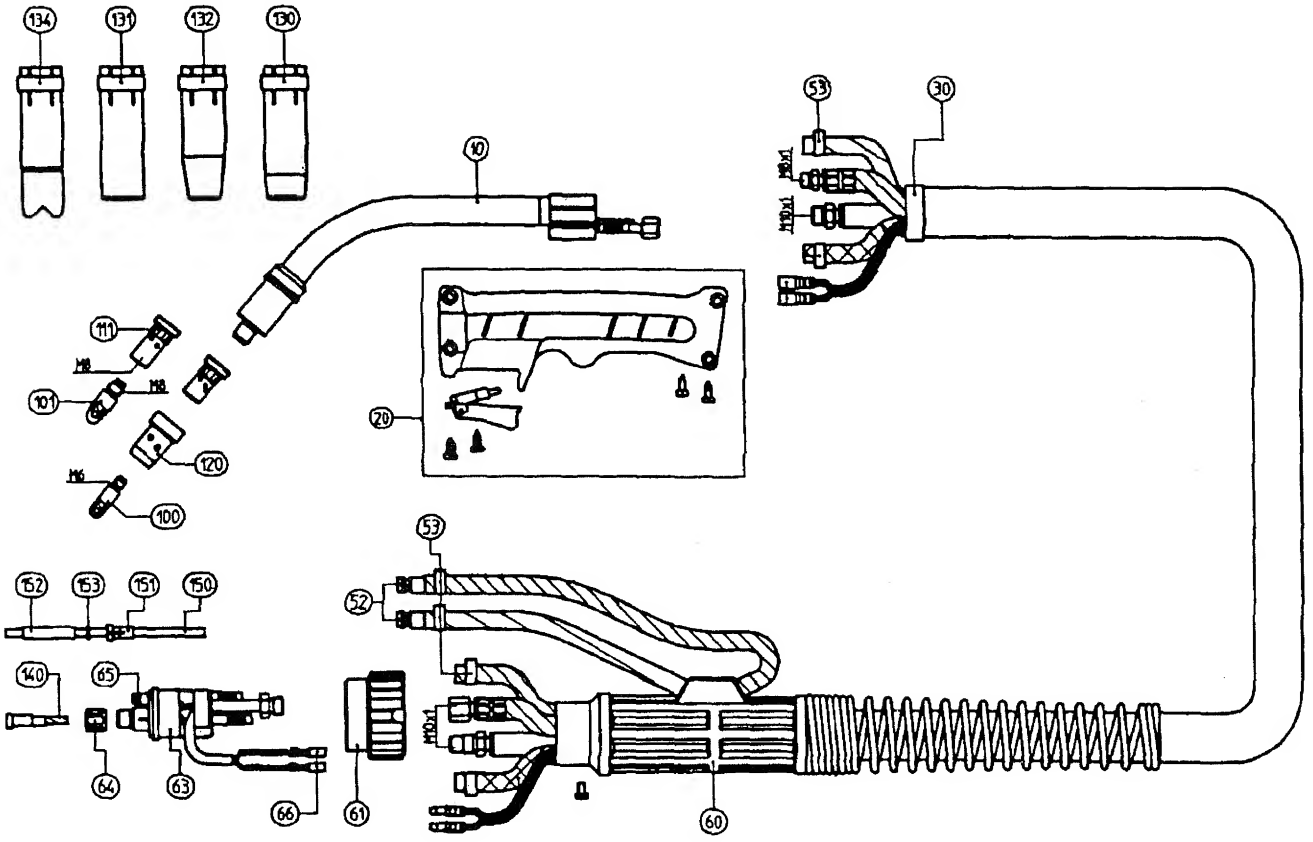


Pos.	Description	Stock-No.
	Welding Torch SB 401/W	
	with torch leads 3 mtr	090 200 8373
	with torch leads 4 mtr	090 200 8381
	with torch leads 5 mtr	090 200 8390
10	Swan neck, complete SB 401	132 702 3876
20	Handle ass'y, red SB 25-SB 501	132 706 4319
30	Lead support	132 704 7660
52	Hose stem	132 710 6739
53	Hose clamp	132 710 6747
60	Cable support ass'y	132 702 3949
61	Adaptor nut	132 706 4076
63	Central adaptor block WZ2	132 702 3930
64	Liner collet M 10x1	132 706 4106
65	O-ring 4.0 x 1.0	132 706 4092
66	Trigger lead connector	132 706 4084
100	Contact tip aluminium M8 - 1.0 mm	132 711 3794
100	Contact tip aluminium M8 - 1.2 mm	132 711 3808
101	Contact tip standard M8 - 0.8 mm	132 711 3891
101	Contact tip standard M8 - 1.0 mm	132 710 6755
101	Contact tip standard M8 - 1.2 mm	132 710 6763
101	Contact tip standard M8 - 1.6 mm	132 710 6771

Pos.	Description	Stock-No.
111	Contact tip holder standard M8	132 710 6780
120	Standard gas diffuser	132 702 3957
130	Gas shroud, cylindrical	132 700 5029
131	Gas shroud, conical	132 700 5010
132	Gas shroud, conical small	132 700 5037
134	Spot weld shroud	132 700 5061
140	Insulated liner 0.8-0.9 3 mtr	132 704 6884
140	Insulated liner 0.8-0.9 4 mtr	132 704 7120
140	Insulated liner 0.8-0.9 5 mtr	132 704 7163
140	Insulated liner 1.0-1.2 3 mtr	132 704 7236
140	Insulated liner 1.0-1.2 4 mtr	132 704 7244
140	Insulated liner 1.0-1.2 5 mtr	132 704 7279
140	Insulated liner 1.6 3 mtr	132 704 7678
140	Insulated liner 1.6 4 mtr	132 704 7686
140	Insulated liner 1.6 5 mtr	132 704 7694
150	Polyamid liner 0.8-1.2 3 mtr	132 714 4550
150	Polyamid liner 0.8-1.2 4 mtr	132 714 4541
150	Polyamid liner 0.8-1.2 5 mtr	132 714 4533
152	Guide tube polyamid liner 4.0 OD	132 704 5578
153	O-ring 3.5x1.5 for guide tube	132 707 5531
	Contact tip wrench (not shown)	132 704 5411

MIG/MAG Welding Torch

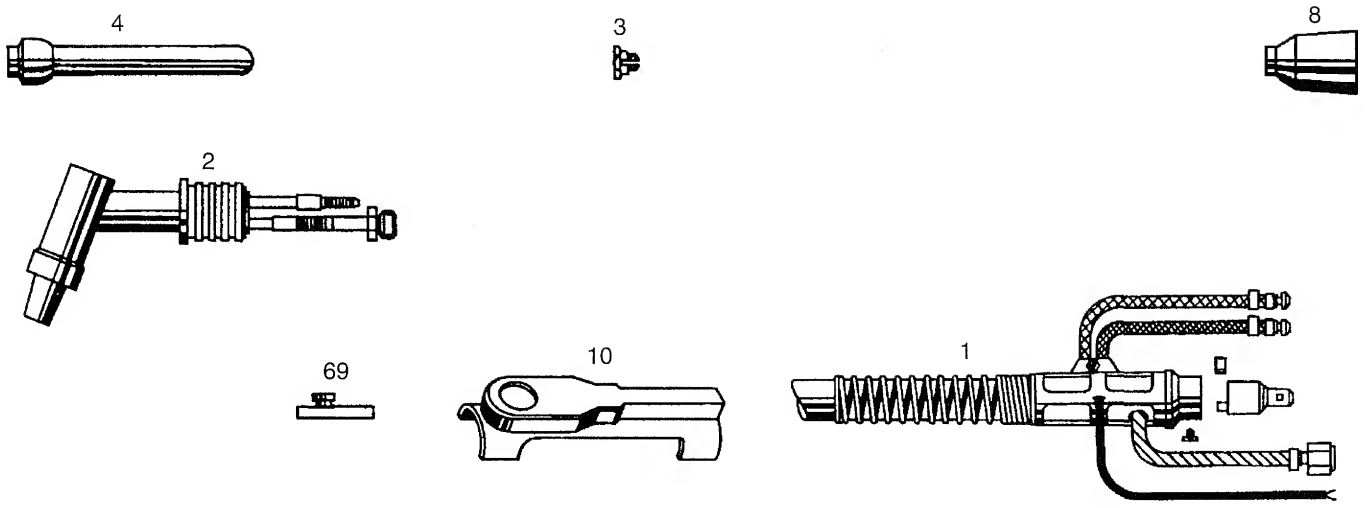
SB 501 W



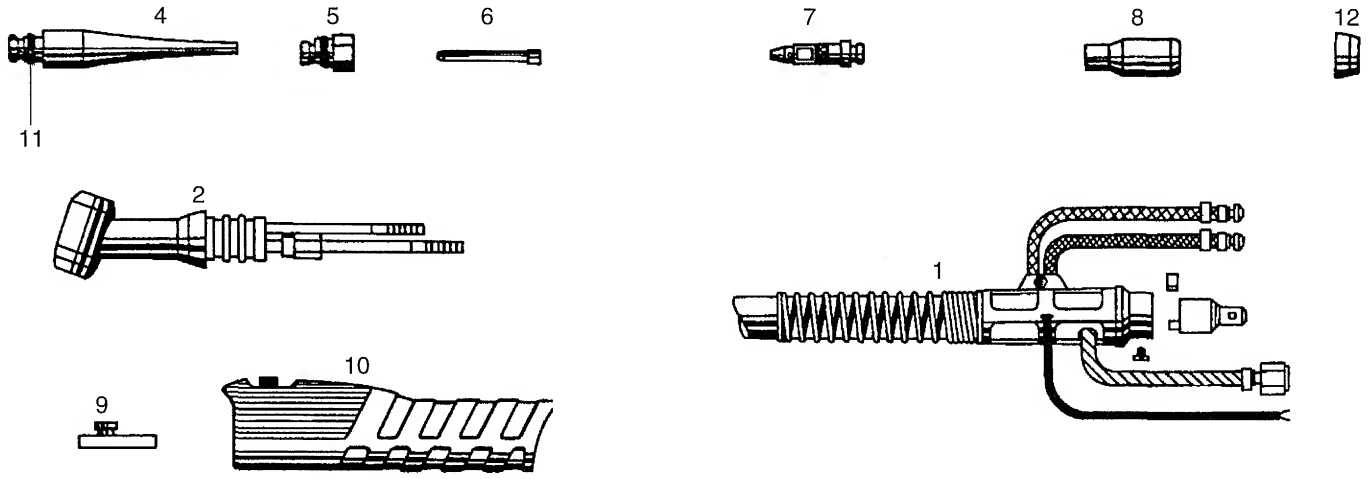
Pos.	Description	Stock-No.
	Welding Torch SB 501 W	
	with torch leads 3 mtr	090 200 8462
	with torch leads 4 mtr	090 200 8470
	with torch leads 5 mtr	090 200 8489
10	Swan neck, complete SB 501	132 710 6720
20	Handle ass'y, red SB 25-SB 501	132 706 4319
30	Lead support	132 704 7660
52	Hose stem	132 710 6739
53	Hose clamp	132 710 6747
60	Cable support ass'y	132 702 3949
61	Adaptor nut	132 706 4076
63	Central adaptor block WZ2	132 702 3930
64	Liner collet M 10x1	132 706 4106
65	O-ring 4.0x1.0	132 706 4092
66	Trigger lead connector	132 706 4084
100	Contact tip aluminium M8 - 1.0 mm	132 711 3794
100	Contact tip aluminium M8 - 1.2 mm	132 711 3808
101	Contact tip standard M8 - 0.8 mm	132 711 3891
101	Contact tip standard M8 - 1.0 mm	132 710 6755
101	Contact tip standard M8 - 1.2 mm	132 710 6763
101	Contact tip standard M8 - 1.6 mm	132 710 6771

Pos.	Description	Stock-No.
111	Contact tip holder standard M8	132 710 6780
120	Standard gas diffuser	132 702 3957
130	Gas shroud, cylindrical	132 700 5029
131	Gas shroud, conical	132 700 5010
132	Gas shroud, conical small	132 700 5037
134	Spot weld shroud	132 700 5061
140	Insulated liner 0.8-0.9 3 mtr	132 704 6884
140	Insulated liner 0.8-0.9 4 mtr	132 704 7120
140	Insulated liner 0.8-0.9 5 mtr	132 704 7163
140	Insulated liner 1.0-1.2 3 mtr	132 704 7236
140	Insulated liner 1.0-1.2 4 mtr	132 704 7244
140	Insulated liner 1.0-1.2 5 mtr	132 704 7279
140	Insulated liner 1.6 3 mtr	132 704 7678
140	Insulated liner 1.6 4 mtr	132 704 7686
140	Insulated liner 1.6 5 mtr	132 704 7694
150	Polyamid liner 0.8-1.2 3 mtr	132 714 4550
150	Polyamid liner 0.8-1.2 4 mtr	132 714 4541
150	Polyamid liner 0.8-1.2 5 mtr	132 714 4533
152	Guide tube polyamid liner 4.0 OD	132 704 5578
153	O-ring 3.5x1.5 for guide tube	132 707 5531
	Contact tip wrench (not shown)	132 704 5411

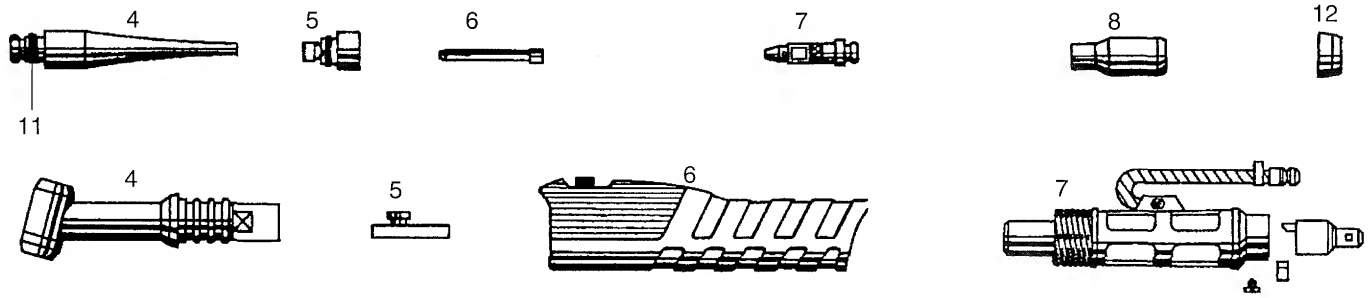
TIG Torch AW 424



TIG Torch SR 18



TIG Torch SR 26



Pos.	Description	Stock-Nr.	AW 424	SR 18	SR 26
1	Torch ass'y - 4 mtr	090 201 2826	●		
	Torch ass'y - 8 mtr	090 201 2834	●		
	Torch ass'y - 4 mtr, water-cooled	090 201 2036		●	
	Torch ass'y - 8 mtr, water-cooled	090 201 2516		●	
	Torch ass'y - 4 mtr, water-cooled, remote control	090 201 2044		●	
	Torch ass'y - 8 mtr, water-cooled, remote control	090 201 2052		●	
	Torch ass'y - 4 mtr	090 200 9108			●
	Torch ass'y - 4 mtr, with remote control	090 200 7156			●
	Torch ass'y - 8 mtr, with remote control	090 200 8055			●
2	Torch body	132 715 7198	●		
	Torch body	132 717 0500		●	
	Torch body	132 714 0147			●
3	Collet 1.6 mm	132 715 7210	●		
	Collet 2.4 mm	132 715 7228	●		
	Collet 3.2 mm	132 715 7236	●		
	Collet 4.0 mm	132 715 7244	●		
4	Back cap, long	132 715 7201	●		
	Back cap, long	132 712 7230		●	●
5	Back cap, short	132 712 7248		●	●
6	Collet 1.0 mm	132 712 7078		●	●
	Collet 1.6 mm	132 712 7086		●	●
	Collet 2.4 mm	132 712 7094		●	●
	Collet 3.2 mm	132 713 5429		●	●
7	Collet chuck 1.0 mm	132 712 7132		●	●
	Collet chuck 1.6 mm	132 712 7140		●	●
	Collet chuck 2.4 mm	132 712 7159		●	●
	Collet chuck 3.2 mm	132 713 5410		●	●
8	Gas shroud, ceramic, size 5 8,0 mm	132 715 7252	●		
	Gas shroud, ceramic, size 6 9,5 mm	132 715 7260	●		
	Gas shroud, ceramic, size 7 11,0 mm	132 715 7279	●		
	Gas shroud, ceramic, size 5 8,0 mm	132 712 7876		●	●
	Gas shroud, ceramic, size 6 9,5 mm	132 712 7175		●	●
	Gas shroud, ceramic, size 7 11,0 mm	132 712 7884		●	●
	Gas shroud, ceramic, size 8 12,5 mm	132 713 5402		●	●
9	Twin touch contact switch red/green buttons	132 717 0488	●	●	●
10	Switch housing	132 717 0496	●		
	Switch housing	132 717 0526		●	●
11	O-ring for back cap	132 712 7892		●	●
12	Heat shield, standard (insulating ring)	132 712 7256		●	●

10.0 Wiring Diagram OMEGA 400 SEK/W; 400 SEK/WX